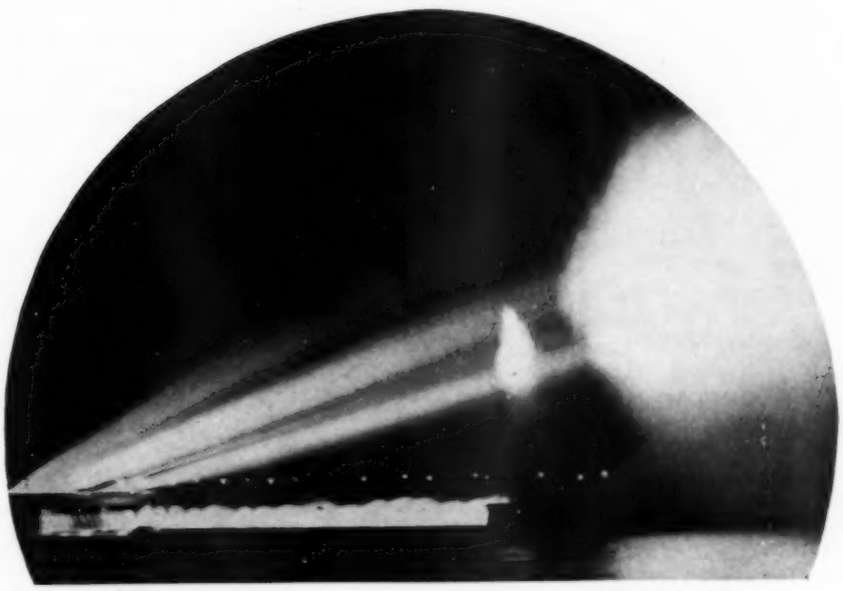
American Machinist

June 20, 1934



Chicago Repeats

K. H. CONDIT
Editor, American Machinist

APATHY may prevail in other sections of the country, but there is no evidence that it affects Chicago or at least those Chicagoans who had the nerve to reopen their Century of Progress in 1934, and to spend $8,000,000 dressing it up and improving it. It was my privilege to be on the Fair grounds on the day before the opening and on the first two days of the Fair both last year and this year, and I, therefore, feel that I am in a position to compare the two versions of the Century of Progress and also the public reception of them.

While the opening festivities were not nearly so elaborate this year as they were last, two events were staged this year that had no counterpart in the previous opening. One of them was the dinner given by Alfred P. Sloan, president of the General Motors Corporation, in the main hall of the General Motors Exhibit in the Fair grounds on the Friday evening just preceding the opening day. At this dinner a dozen speakers scouted the idea that the progress in this country is finished and that our principal task now is to settle down and divide up the available work among a population that is soon to become stationary. They predicted scientific and industrial developments in the next century that will over-shadow anything we have so far experienced, and they thus set the stage for this year's exposition which will show many things that had not been developed at the time last year's show was arranged. For instance, at the conclusion of the dinner and at the invitation of Carl Gray, president

of the Union Pacific Railroad, the diners adjourned to a nearby railroad track and inspected the high speed, aluminum, streamlined, three-unit train built for the Union Pacific by the Pullman Company. This train had not been built a year ago, but since the closing of the 1933 exposition it has traveled many thousands of miles and thoroughly proved its effectiveness.

The other interesting event of the opening days was the brilliantly staged run of the Chicago, Burlington & Quincy Railroad's "Zephyr" from Denver nonstop to Chicago. It made the 1,017 miles in 809 minutes, or an average speed of close to 80 miles an hour, and when it rolled slowly onto the stage of the Wings of the Century concession at about 8:30 Saturday evening as a climax to the splendid educational and artistic pageant put on at that concession, even the most hard-boiled observer felt a real thrill. This train and a six-car successor of the Union Pacific train will be on exhibition on the railroad tracks just south of the Transportation Building from July on.

Changes made in the arrangement and introduction of new features this year are all in the nature of improvements. For instance, the old Midway which had some concessions last year that had little to recommend them, has been moved over on to Northerly Island and replaced by a dozen national villages that are calculated to make the visitor feel that he is in the land of the respective community. These villages are all concessions, it is true, but the architectural construction and the illusions created by the background scenery are so perfect that they add a touch that was largely absent from last year's Fair.

Changes From Last Year

Visitors to this year's Fair who attended the one staged last year will be struck by the change in the whole color scheme. Colors are softer, at least under daylight, and generally more pleasing. The enormous new fountain which plays under colored lights is a fascinating thing to watch. Many exhibits have been better arranged for the convenience of the spectator. There are more restaurants and lunchrooms and better ones. The scientific exhibits, many of them, have been entirely revised and improved on the basis of the experience of a year ago. New programs are on at the House of Magic of the General Electric Company, and the liquid air theatre of Union Carbide & Carbon. Westinghouse Electric has a theatre with revolving stage on which is presented a little drama of the advances in domestic electric equipment. It also has a whole new series of electrical demonstration devices.

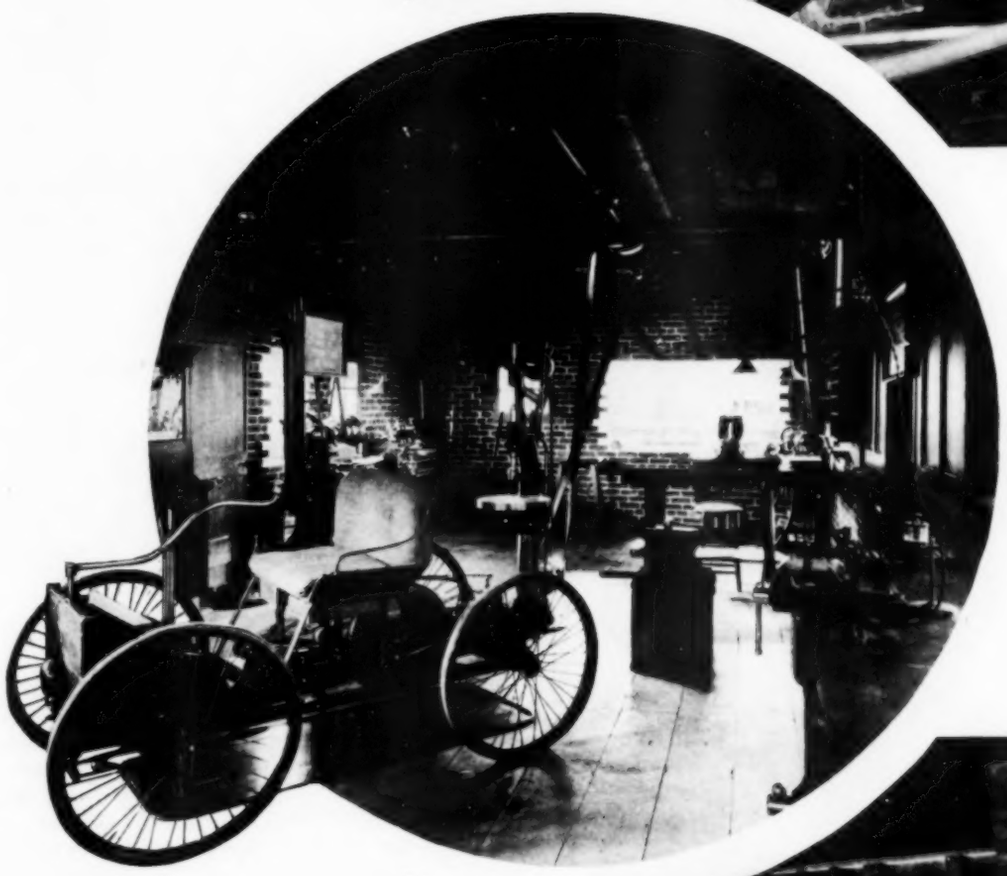
Outstanding in the International Harvester Exhibit are its radio controlled farm tractor, which runs around a field without any visible operator, and the installation of machinery for spinning and balling binder twine where, in addition to the actual machinery, pictorial displays show the other steps in the production of binder twine from the gathering of the raw material to the operation of the knot-tying device on a grain binding machine.

General Motors has revamped its Chevrolet assembly line to make it easier for spectators to see exactly what happens in every operation. It has added to and improved the displays of parts manufactured by subsidiary companies and has added a soundproof, lightproof, air conditioned room in which are housed the various exhibits of the Research Laboratories. The Chrysler exhibit close by includes several new machines, notably a machine for forming upholstery springs and a forging hammer. Barney Oldfield's "Hell Drivers" are putting on an even more hair-raising demonstration in the bumpy, sandy infield of the Chrysler track than they did last year. Studebaker has brought the biggest automobile ever built and has it in the Transportation Building. Inside of it is a movie theatre in which are displayed films of Studebaker practices. Hupmobile has a complete line of cars on show and Nash is again using the Whiting Parking Tower to display its new line of cars.

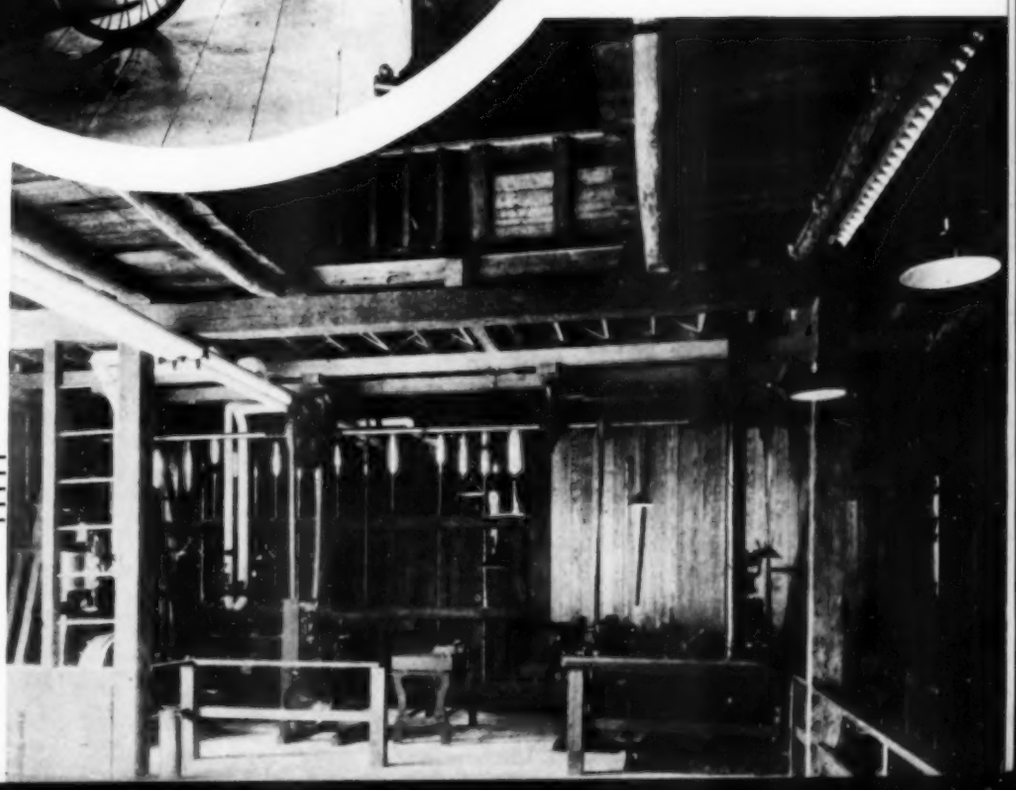
Outstanding among the new exhibits in the Industrial Building is the Fairbanks-Morse display. The company is 104 years old and is celebrating both its own and Chicago's century of progress by showing samples of its modern products. Its original product, the weighing scale, is represented by a modified personal scale so sensitive that it registers the changes in inertia caused by pump-

Panorama of transportation progress in the Ford exhibit showing some of the vehicles and a portion of the 600-foot photographic mural

Looking through the flywheel of the steam engine which supplies the motive power for the machine shop of an earlier day. Some of the machine tools assembled here are more than 100 years old—Ford exhibit



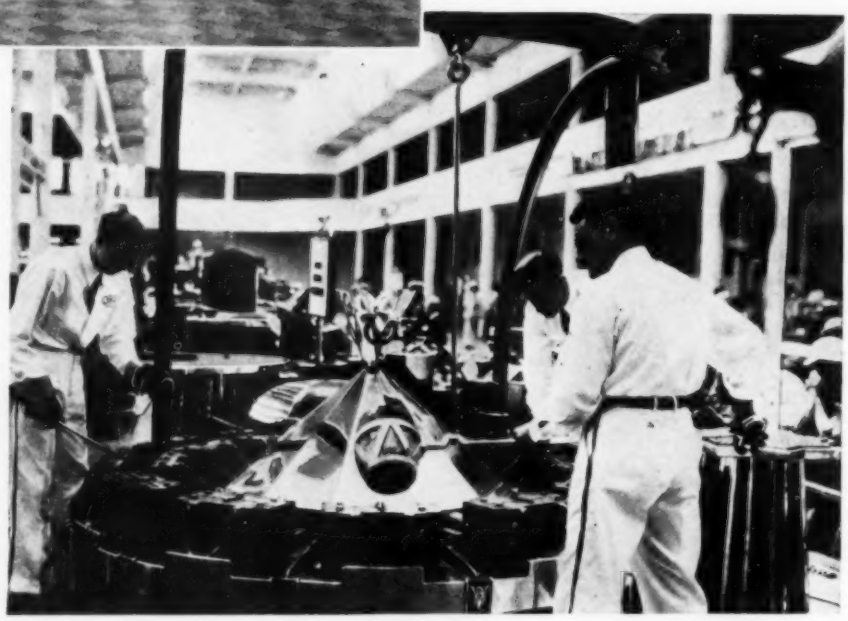
A replica of the machine shop where Henry Ford built and assembled his first automobile more than 40 years ago



Machine shop in Ford's mechanized barn. Simple automobile parts can be built in spare time

Operating welders used in the manufacture of Kelsey-Hayes wheels for Fords. Each one performs a different operation

Pouring electric furnace steel into permanent molds to form the valve pushrods for the Ford V-8 engine

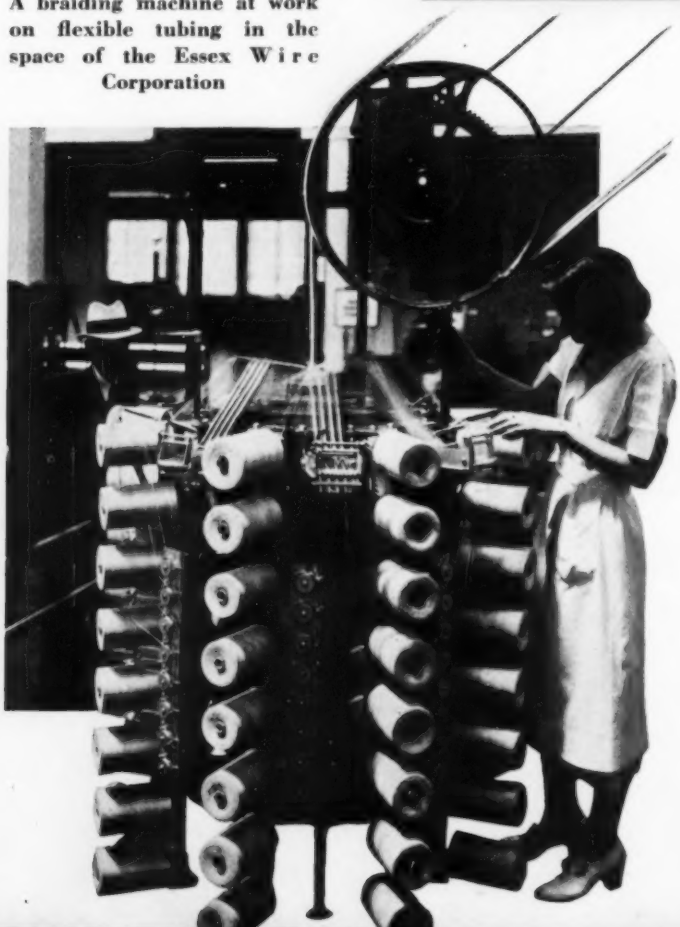


ing of the blood of the individual standing on the platform, a mine car scale, and a mechanical recording platform scale.

A sectionalized 6-cylinder opposed piston Diesel illustrates the most recent design in the company's line of oil engines, of which other types are also on display. The industrial line is represented by gear, suction and centrifugal pumps for various uses, and by a few of the types of electric motors manufactured. The domestic machinery line includes a mechanical stoker, a refrigerator, radio models, a washing machine, a farm gasoline engine, a home water system and an air-conditioning outfit.

Down at the Home Planning Hall there are plenty of examples of new developments in machinery for the home, in the living room, the kitchen and the basement. Progress in automatic stokers and in air-conditioning units is notable.

A braiding machine at work on flexible tubing in the space of the Essex Wire Corporation



In the Transportation Building most of the railroad companies have revamped and improved their exhibits but the one that attracts most of the men is the display of toy trains by the American Flyer Company. If the intention was to appeal to small boys among the visitors, it is just too bad because every time I was near this exhibit, it was lined four deep by men (yes, I was one of them). Here on four concentric track systems was all of the elaboration now available in toy train equipment. Ten or a dozen trains were racing around with signals blinking and switches clicking in a most fascinating manner.

From the point of view of men in the metal working industry, however, the great gap in last year's show has been filled. Last year there were plenty of chances to watch machines, the products of the metal working industry, in oper-

ation, making shirts and hosiery and radio tubes and packaging food products, but machine tools, themselves, were almost entirely missing. This year they are present—plenty of them—in the Ford exhibit.

Mr. Ford stayed away from the Century of Progress last year but his experience with his industrial exhibits in several important cities last winter evidently proved to him that it is worthwhile to exhibit in places where the crowds will come. At any rate, he is here this year with an exhibit based partly on his experience with the industrial exhibits and taken partly from his Dearborn Museum.

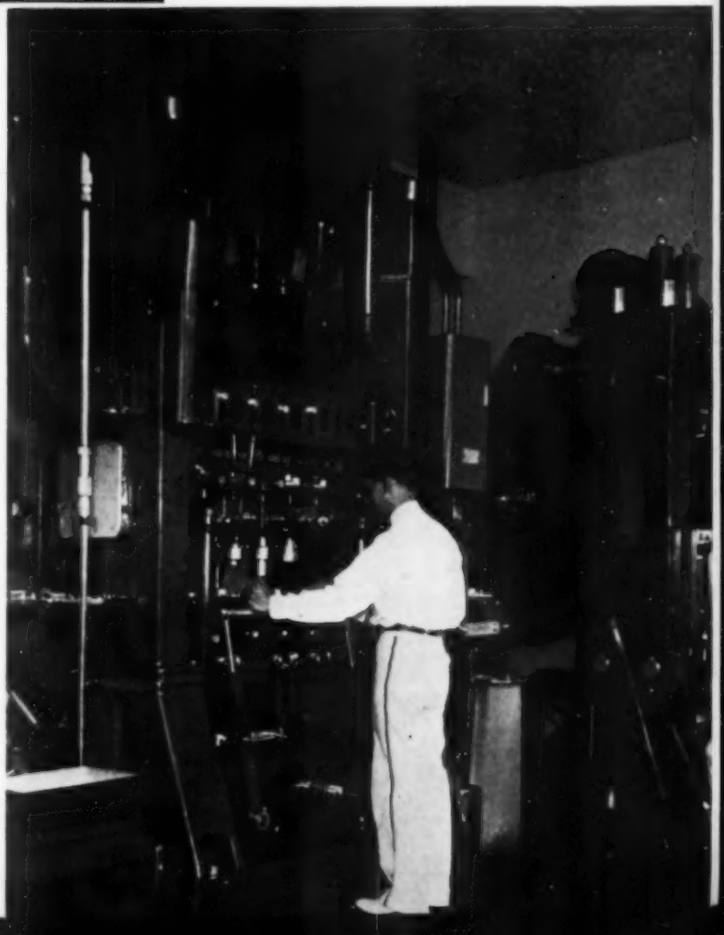
In the central annular section of his building, he has on display 65 vehicles, horse-drawn and motor driven, which trace the evolution of transportation from the drag and the Egyptian chariot down to the 20,000,000th Ford. Around this room is a photographic mural, 600 ft. long by 20 ft. high, which portrays operations in the various Ford factories. In an enormous wing extending to the North, 21 of the companies making parts for the Ford car cooperate with him in an industrial exhibit that is about three times the size of the ones used last winter. A list of them follows:

1. Aluminum Company of America, Pittsburgh, Pa.
2. The American Brass Company, Waterbury, Conn.
3. Anaconda Copper Mining Company, Waterbury, Conn.
4. Amoskeag Mfg. Company, Manchester, N. H.
5. Bendix Products Corporation, South Bend, Ind.
6. Briggs Mfg. Company, Detroit, Mich.
7. Champion Spark Plug Company, Toledo, Ohio.
8. Detroit Gasket Mfg. Co., Detroit, Mich.
9. Essex Wire Corporation, Highland Park, Mich.
10. Houdaille-Hershey Corp., Buffalo.
11. Kelsey-Hayes Wheel Company, Detroit, Mich.
12. Motor Products Corporation, Detroit, Mich.
13. Murray Corporation of America, Detroit, Mich.
14. Shelton Looms, New York City.
15. Stewart-Warner-Alemite Corporation, Chicago.
16. Thompson Products, Inc., Detroit, Mich.
17. Timken-Detroit Axle Company, Detroit, Mich.
18. United Engineering and Foundry Co., Pittsburgh, Pa.
19. United States Rubber Company, New York City.
20. Waltham Watch Company, Waltham, Mass.
21. L. A. Young Spring & Wire Corporation, Detroit, Mich.

It is entirely impossible in the space available here to make any sort of a description of all of the various operations performed in this hall. They include, however, most of the important manufacturing processes involved in automobile part manufacture and the throngs of people that visited them on the opening days were sufficient evidence that the Ford exhibit would be a center of attraction throughout the period of this year's exposition.

On the mezzanine balcony surrounding the Industrial Hall is a good exhibit of the work done at the Ford Industrial School. Boys from each of the four classes are shown at work on the machines which they use in the respective years, and on the operations performed on those machine. All of the standard machine tools are represented.

The Ford exhibit is a splendid example of what a good industrial de-



Above—One of the spectacular operations in welding automobile bodies in the section devoted to complete body manufacture by the Briggs Manufacturing Company. Right—Punch press equipped with progressive dies turning out covers for Ford generator cut-outs. A coining press in operation is visible at the right

A general view of the International Harvester exhibit which includes all kinds of agricultural machinery, motor trucks and delivery wagons. Many of the exhibits are in motion to illustrate operating principles

A new development in the spinning and balling of binder twine. Photographs show other stages in its manufacture

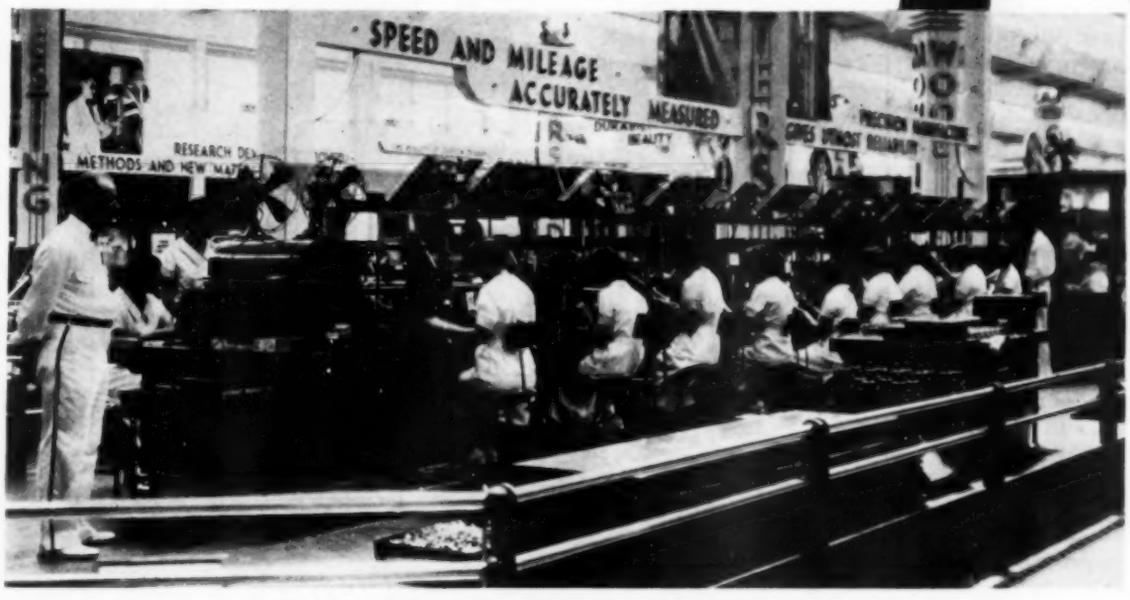
signer can do in coordinating many more or less related exhibits into a unified whole. In collaboration with Albert Kahn, of Detroit, architect of the building, Walter Dorwin Teague, of New York, designed and supervised the installation of the exhibits and worked out the continuity of the photographic mural. Execution of the mural was by Kaufmann & Fabry, official photographers of the Fair, who also took the photographs with which this article is illustrated.

The center of interest for men in the machinery industry, however, will be the Northern wing of the main building which contains the replica of the original Ford machine shop with all its equipment, a steam engine driven shop of an earlier day, containing machine tools, some of them over 100 years old, examples of the earliest electrical generating equipment, and a display of the latest inspection and gaging apparatus.

Back of this extension is the barn built by Mr. Ford's father the year he was born. In it is a complete machine shop where automobile parts can be built by a farmer in his spare time, particularly in winter. There is also the

At the Bendix section of the Ford exhibit carburetors for Fords are assembled and tested in full view of visitors

U. S. Rubber Company's display in the foreground, an Amoskeag loom to the left with the safety plate glass machine behind it and the "jewel case" display of Ford parts, top center



Assembling Ford speedometers at the Stewart-Warner-Alemite space. Photographs show other manufacturing operations

processing machinery for transforming the soy bean into useful domestic and industrial products. The barn was put here to illustrate Mr. Ford's theory that the solution of our domestic difficulties lies in decentralization and the combination of home industry with agriculture.

Across the main road from the Ford Building, Mr. Ford has constructed a park with a tar macadam road running around it. Parallel to this road and adjacent to it, so that a car can be driven off upon it, is another road which is a composite made up of sections of 18 of the most famous roads of history, from the Great Road of China, the Appian Way, the Desert Road, and Watling Street down to the gravel, corduroy and dirt of our own primitive days. The marvel of the Ford exhibit is that the whole thing was constructed in three months working time. Normally, it would have taken at least eight months.

Is it worth going to the Fair again if you went out last year? Most certainly yes. Practically all of the exhibits you saw last year have been changed and improved, and in addition you have such innovations as the Ford exhibit and the National Villages. Chicago has had the courage to repeat a National or rather International Exposition for the first time in history. I believe it is going to pay and I hope that some part of it at least will be made permanent.

Turret-Lathe Tooling for Gear Cases

F. H. MAYOH

GROUP TOOLING for production involves the tool engineer in a search for reasonably cheap set-ups, which often results in placing the job in the turret lathe where advantage can be taken of the several turret holes or faces for holding the tools in such position that they can be brought into successive operation in relation to the work. The term double duty might be used in describing the combination illustrated for machining the gear case shown in heavy dotted lines, for the machining involves the use of two complete sets of tools.

Referring to Fig. 1, in the first operation the short drill *A* spots the small hole in the hub. The drill is held in a split bushing in a holder, which, in turn, is held in the first hole in the turret. The holder enters freely into the large chamber of the work and supports the drill close to the surface to be spotted. In the second hole in the turret is the long drill *B* used in the second operation for drilling the hole just spotted. This drill is also held in a split bushing in a holder. The two cutters *C* for rough boring the open end are located in slots in the drill holder and are held in place by screws in the plates *D*. The small view at the left indicates how the cutters are ground in relation to a theoretical line passing through the center of the holder.

In holding the work for this operation, the first objective is to center the radial portion at *X*. This is accomplished by keeping the two chuck jaws *F* in a fixed position. The second objective is to center the boss for the worm shaft so that it will be correctly aligned at a right angle to the hole to be bored in this operation. This is accomplished by making the gripping face of the jaw *H* of such shape that it will grip the work and center it accurately.

The third operation consists in finish boring the small hole with the cutter *J* and finish boring the open end with cutter *K*, both cutters being held in the same bar, which is held in the third hole in the turret. At the same time, the open end is finish faced by the tool *L*, which is mounted in a block in the front cross-slide. The rough facing of this end was done with a similar tool (not shown) while rough boring in the second operation, the tool being held in a block in the rear cross-slide. Referring to the lower view, the cutter *M* is mounted on a back-facing bar operated through the spindle, and back faces the hub with which it is in contact. To complete the work in this set-up, the small hole is finished by the floating reamer *N*. While the tools in this set-up are not piloted, they are sufficiently rigid and self centering for the job.

Referring to Fig. 2, the holding fixture *A* locates the work by the holes in both the open end and in the hub. The fixture is screwed on the spindle nose and is so constructed as to be in running balance. The plug *B* is fitted in a lug in the fixture and is held by screws, its end fitting into the finished, open end of the work. On the opposite side of the fixture, the plug *C* enters the small hole in the work and is held in place by a screw; otherwise it is free to slide in its guide. The outer end is knurled for a grip and holes are drilled for a pin to be used to move it in case it should stick.

In loading the fixture, the plug *C* is

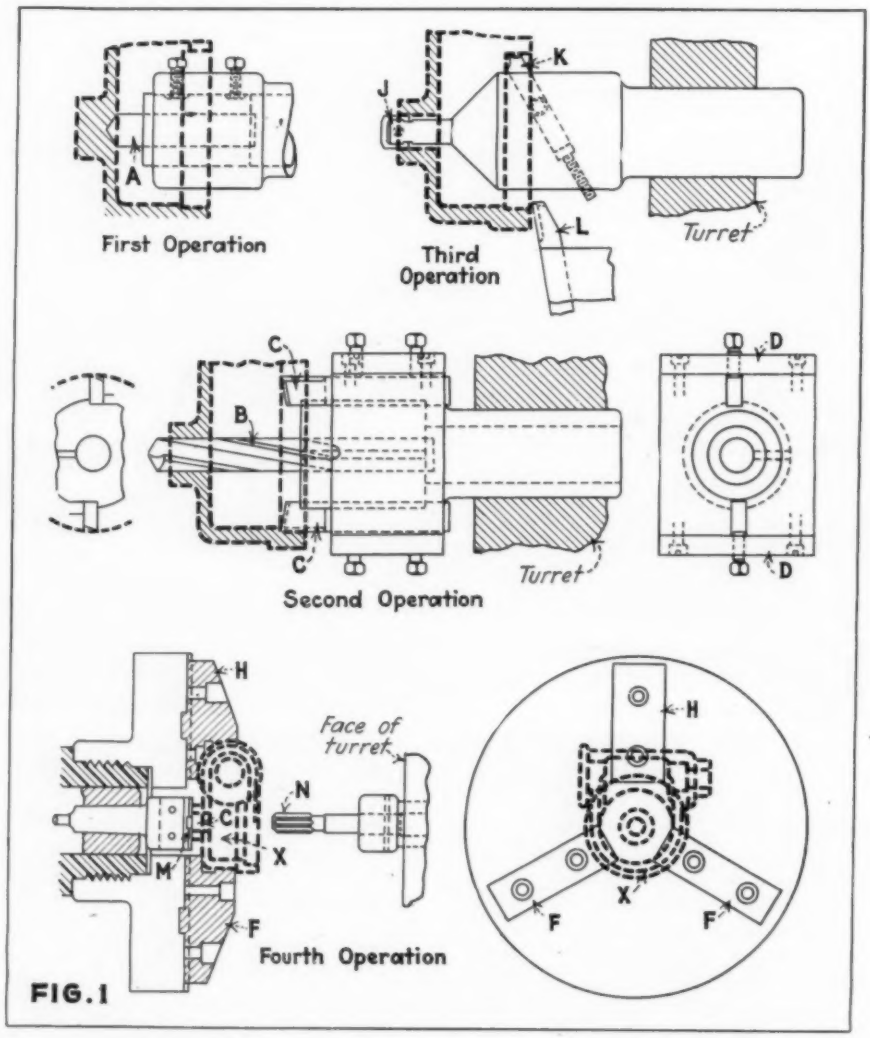


Fig. 1—While the tools in this set-up for the first three operations are not piloted, they are sufficiently rigid and self centering to do the work satisfactorily

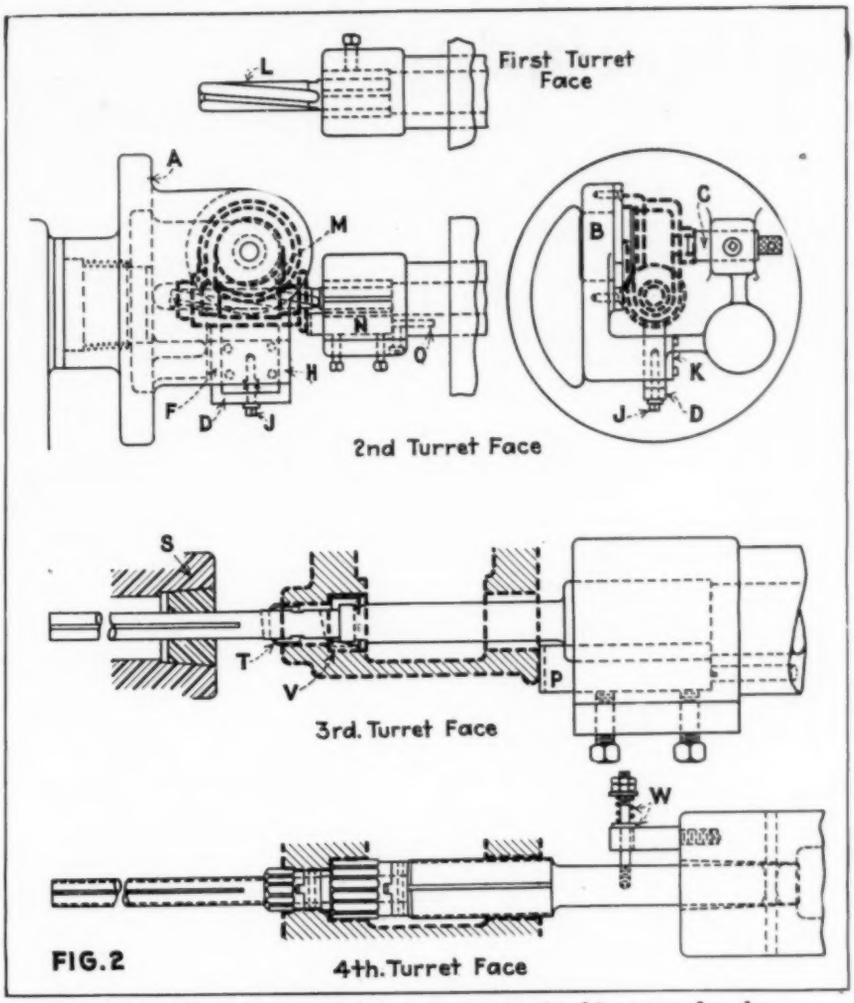


Fig. 2—The tools for boring and reaming in this set-up for the last four operations are piloted in a bushing in the spindle. The reamers are mounted in floating holders

pulled back out of the way and the open end of the work is slipped over the end of plug *B*. Plug *C* is then entered into the small hole and is held by its screw. The work is clamped by the yoke *D*, which slides in the slots *F* and *H*. Screw *J* moves the yoke and causes it to grip the work. Since the legs of the yoke are quite far apart, they cause the work to pivot about the plugs *B* and *C* as centers, so that the worm-shaft boss is aligned parallel with the center line of the fixture. The yoke is held in place by the plate *K* and is loosened from the work by a spring when the clamping screw is backed away.

The operations performed on the work in this set-up are core-drilling the holes for the worm shaft, while at the same time rough facing the end of the boss; boring the holes for the worm shaft, while at the same time finish facing the end of the boss; and reaming the holes for the worm shaft. Starting at the upper part of the illustration, the core drill *L* is held in a split bushing that is tightened by a screw in the holder, which, in turn, is held in the first hole in the turret. Next below, the smaller core drill *M* is also held in a split bushing in a holder held in the second hole in the turret. Mounted on the same holder is the cutter *N* for rough facing the end of the worm-shaft boss, this cutter is backed up by screw *O*, which is also used for adjusting it.

In the part of the illustration next to the bottom is shown the boring bar and cutters for boring the holes for the worm shaft. The bar is held in a holder in the third hole in the turret by screws that also clamp the cutter *P* for finish facing the end of the worm-shaft boss. Mounted in the machine spindle, the pilot bushing *S* supports the outer end of the boring bar, which is grooved for lubricating purpose. Cutter *T* bores the smaller hole, while cutter *V* bores the two holes of larger diameter.

Referring to the lower part of the illustration, the tools for reaming the holes just bored are mounted on a bar of special type. The bar is held in a holder in the fourth hole in the turret and has a long pilot that is guided in the bushing referred to above. The reamers are driven by driving collars pinned to the bar. After the larger reamer has passed through the first hole, the part of the bar behind the reamer fills the hole and acts as a rear pilot. The bar floats in the holder, the spring device at *W* balancing its weight.

The tools illustrated in Figs. 1 and 2 make possible the performance in sequence of most of the operations on the work with but two settings. The additional tools necessary for completion of the work are a jig for drilling some small holes and a drill-press fixture. The fixture is illustrated in Fig. 3 and is for facing the surfaces *A*. The work is mounted on the short plug *B*, the small hub being in contact with the upright *C*, while the finished face of the open end is in contact with the upright *D*, thereby preventing the work from turning.

The work is clamped down with the finished end of the worm-shaft boss against the collar on the plug by the clamp *F*, which has a forked end to straddle the boss. The boring bar *H* is fed down through the hole and the double-faced cutter *J* is passed through the open end into the hole and is slipped into place on the bar, where it is fastened by a screw. The surfaces *A* are finished by feeding the bar first down and then up.

An important point, often overlooked when considering the tooling for work of a circular shape, is that fixtures attached to the spindle nose for rotating the work will sometimes make machining a comparatively simple operation on work that would otherwise be difficult to handle.

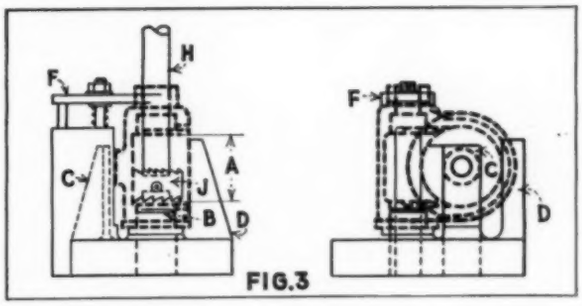


Fig. 3—The only major operation in which the turret lathe is not employed is performed in the drill press with this fixture

Arc-Welding Aluminum

A. F. DAVIS
Vice-President, Lincoln Electric Company

RAPID increase in the use of aluminum in many varied industries has resulted in a demand for an efficient and economical method for arc-welding that metal. The manufacturers of arc-welding equipment and electrodes set their research men at work on the problem and, several years ago, developed an electrode for aluminum welding. Numerous changes in electrode composition and in welding technique have advanced the art so that today aluminum can be readily welded by any operator who is proficient in welding mild steel.

In order that the procedure outlined here may be specific rather than general, the process will be described with the use of Aluminweld electrodes, manufactured by the company with which the writer is connected. This electrode is a heavily-coated rod of the shielded-arc type and is used in reverse polarity—that is, the electrode is connected to the positive pole and the work to the negative pole. A short arc is held with the coating approximately touching the molten pool of weld metal.

The electrode is held perpendicular to the work at all times and is directed so that both edges of the metal to be welded will be properly and uniformly heated. The electrode is advanced along the seam at a rate of speed that will provide a uniform bead.

Porosity May Be Avoided

The high melting rate of aluminum makes it necessary to observe certain precautions in order to produce the desired results. Very little heat is dissipated into the base plates, so that the molten metal is chilled and has a slight tendency to cause porosity along the line of fusion. In the vast majority of cases this slight tendency to porosity can be overlooked, as it is comparatively small. If it should be objectionable, it can be entirely eliminated if the plates are heated for some distance on each side of the seam to a temperature of from 600 to 700 deg. Fahrenheit.

Due to the high melting rate of aluminum, a 14-in. electrode lasts approximately 25 seconds. This means that there will be numerous starts and stops along the seam to be welded. In order to secure a smooth bead, the slag should be removed for a distance of approximately one inch beyond the crater be-

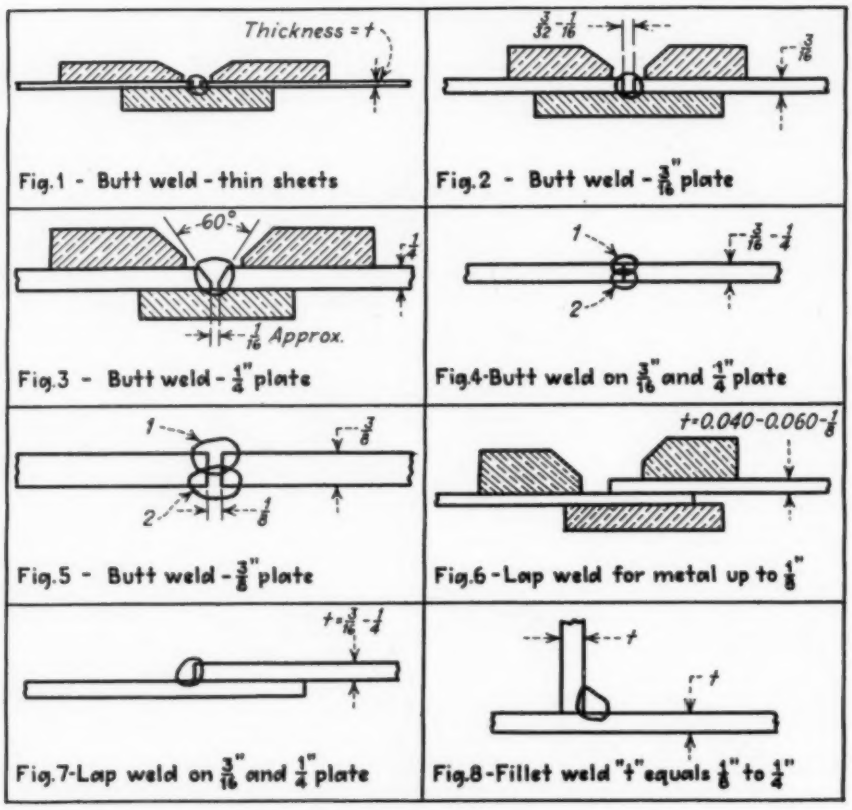


Fig. 1 - Butt weld - thin sheets
Fig. 2 - Butt weld - 3/16" plate
Fig. 3 - Butt weld - 1/4" plate
Fig. 4 - Butt weld on 3/16" and 1/4" plate
Fig. 5 - Butt weld - 3/8" plate
Fig. 6 - Lap weld for metal up to 1/8"
Fig. 7 - Lap weld on 3/16" and 1/4" plate
Fig. 8 - Fillet weld "t" equals 1/8" to 1/4"

Data for Arc Welding of Aluminum

Joints	Beads or Passes	Electrode Size	Current Amp.	Min. Arc Volts	Speed, In. per Min.	Actual Welding Speed, Ft. per Hr.	Lb. of Electrode per Ft. of Weld
Fig. 1							
18 ga. sheet	1	3/32	40	20	22	110	0.011
Fig. 1							
1/8" plate	1	3/32	120	20	16	80	0.0537
Fig. 2							
3/16" plate	1	1/16	170	20	12	60	0.100
Fig. 3							
1/4" plate	1	1/4	250	20	12	60	0.140
Fig. 4							
3/16" plate	1	1/16	170	20	17	..	0.070
	2	1/16	170	20	17	..	0.070
						42.5	0.140
Fig. 5							
3/8" plate	1	1/4	250	20	12	..	0.140
	2	1/4	250	20	12	..	0.140
						30	0.280
Fig. 6							
14 ga.	1	1/8	65	20	13	65	0.033
Fig. 6							
1/8" plate	1	3/32	120	20	16	80	0.0537
Fig. 7							
3/16" plate	1	1/16	170	20	14	70	0.086
Fig. 8							
1/8" plate	1	3/32	120	20	12	60	0.0715
Fig. 8.							
1/4" plate	1	1/16	170	20	9	45	0.133

fore striking another electrode. The electrode should be struck in the crater and then moved quickly back along the completed weld for about one inch. Then the electrode is brought back along the seam, care being taken that the crater is completely melted.

The most certain method of removing excess flux is to chip it off and soak the weld in either a hot, five-per cent solution of nitric acid or a warm, ten-per cent solution of sulphuric acid for a short time. After soaking, the weld should be rinsed in hot water.

In making butt welds, the work should be held in position by jigs and should be backed up by copper, as indicated in Fig. 1. When butt welding plates ⅛ in. thick or thicker, the copper backing should be slightly grooved beneath the joint to be welded. Butt joints in ⅜-in. plates or thicker should be welded with two beads, as indicated in Figs. 4 and 5. No backing or clamping is required for welding joints in this manner.

Clamping Thin Plates

Lap welds should be made in accordance with the general procedure outlined above, except that the manipulation of the electrode should be in the manner of a short, rotary motion, playing the arc first on the upper plate and then on the lower one. The electrode should be held so that the angle between it and the horizontal plate is approximately 45 deg. Plates or sheets of ⅛ in. or less in thickness, as indicated in Fig. 6, should be clamped in position for welding.

Fillet welds are made in accordance with the procedure outlined above, the electrode being held at an angle, as in the case of lap welds.

Vertical and Overhead Welding

The designer should keep overhead and vertical welding of aluminum to a minimum. However, it is sometimes necessary to make this type of weld. The procedure to be followed is the same as that recommended for horizontal welding. Welding in the vertical plane can be accomplished either downward or upward with straight beads, or by weaving. Overhead welding should be done with a number of straight beads. The general instructions as to holding a short arc, uniform rate of welding, etc., should be followed.

If the procedures outlined above are carefully followed, no difficulty will be found in securing sound welds of uniformly high quality. In the accompanying table are given speeds that can be secured, together with recommended electrode sizes and the current setting of the machine. The speeds given are for actual welding time only, on allowance for fatigue, cleaning or setting up being given. The arc-voltage indicated is the actual voltage across the arc while delivering a specific current. The amount of electrode used per foot of weld will vary somewhat, depending upon the fit-up and other conditions. The figures are approximate only.

What is a 14-in. x 6-ft. Engine Lathe? Discussion

OTTO A. WAGNER

In an article of the above title (*AM*—Vol. 78, page 318), C. W. Spicer seems to say that he is altogether at sea on the matter and proves it with some catalogs. The writer does not claim that under existing conditions he can put Mr. Spicer right, but thinks he knows what it ought to mean. It ought to mean that the capacity of the lathe in question is a plain cylinder 14 in. in diameter and 6 ft. long; that is, the size given for any lathe ought to be the size of cylindrical work it will take that would be, first, the largest work it will swing over the tool rest and, second, the longest work it will take between centers. This would be the nominal size of any engine lathe though it would not tell all about the capacity of the machine. Other capacities would come in the detailed description.

The next detail would be the faceplate capacity or the largest work, such as pulleys, the lathe would swing over the ways. A fourth would be its capacity for removing metal, which would be hard to express in figures, but would be best achieved by dividing lathes into about five general classes, thus: extra light, light, medium, heavy, and extra heavy duty lathes. Greater or fewer classes than these might be more desirable, but those given will illustrate the idea at least.

Accuracy and Weight

The fifth detail of description would be the matter of elaboration or refinement. This takes in the matter of controls for speed, feed and accuracy, and for this I would recommend three general classes: low, medium and high elaboration The sixth point in description should be the weight of the bare machine not including countershaft, motor or shipping extras. Thus a lathe the writer has would be described as an 8 in. x 5 ft. engine lathe, faceplate capacity 13¼ in., medium duty low elaboration, weight: 1,400 lb. Yet classes and terms to describe metal removing capacity and refinements other than I have given might be more desirable and should be worked out by machine tool builders' organizations.

Capacity to Remove Metal

Descriptions as applied to planers seem more nearly ideal than any others in present use. This is always the length, width and height of the largest piece of work taken by the machine described. Milling machines are sometimes described this way, but Nos. 1, 2, 3 etc., in themselves mean little, as different makers build machines that differ greatly in detail though known by the same numbers. A consultation of catalogs is necessary to clear up the details, and then sometimes all is not clear especially as to metal-removing capacity.

It seems to the writer that machine tool makers sometimes illustrate metal-removing capacity by citing tests that have been made with their machines under ideal conditions, where the machine has removed astonishing amounts of metal and carried a rate of metal reduction that it could not be expected to do under any and all conditions.

Complete standardization of machines, that is, all makers building to the same dimensions and designs in every particular would not be desirable or good for the industry as it would put an end to improvements. All of our machines have been brought up to their present high efficiency by individual inventors and designers who have exercised their personal abilities unhampered. Any future improvements will come over that same route, and we want no restrictions. It might be all right for Japan and Soviet Russia to copy the United States and western Europe but we have not built that way. However, we do need a standardized system of describing our machines to prospective users, something like the one given above. This would in no way restrict but rather would stimulate improvement.

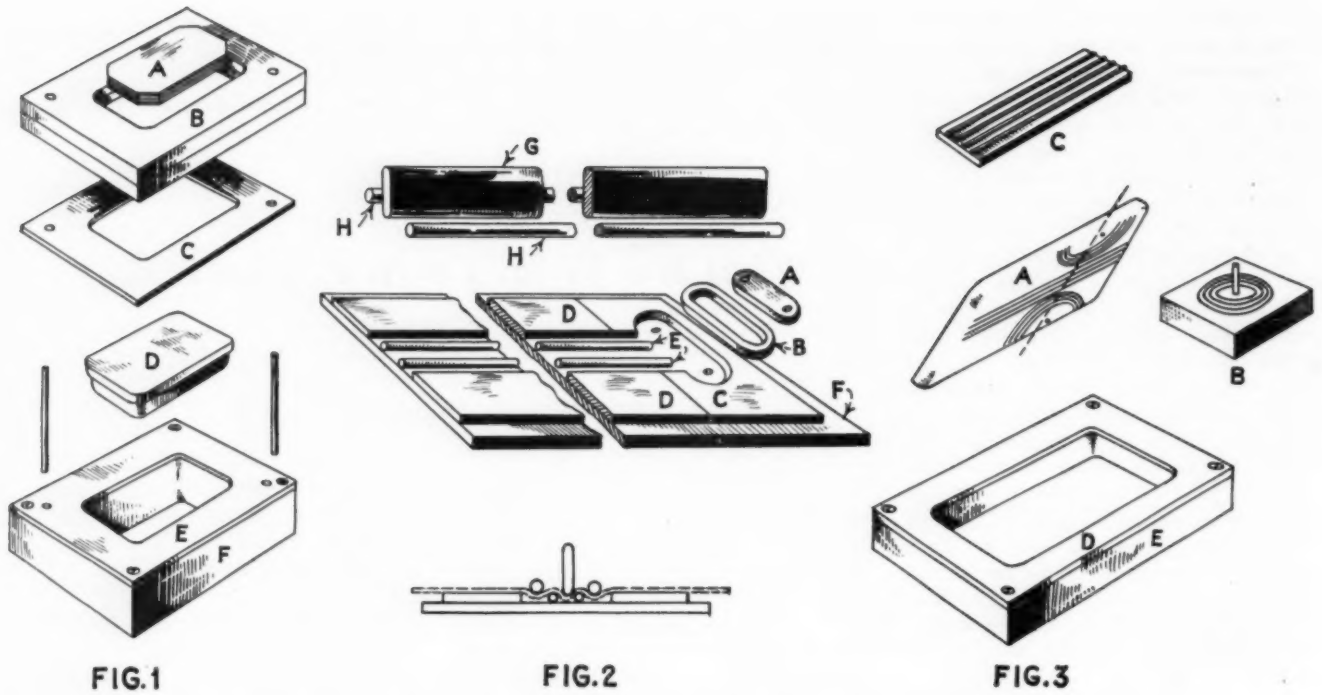


FIG.1 FIG.2 FIG.3

Fig. 1—Bases are drawn with these tools made of wood, steel and celotex. Fig. 2—Cold-rolled steel and scrap parts serve to emboss the center bands. Fig. 3—Trays are drawn and embossed with these simple tools

Drawing and Forming Dies for Experimental Work

J. D. BOLESKY
Mansfield Works, Westinghouse Electric & Manufacturing Company

IN THE laboratory we are constantly confronted with the problem of making special apparatus and samples where drawn parts are used. Drawing dies, as they are ordinarily made, are too expensive to make for these parts, so that jobs of this kind are generally done by hand, and the necessary corners welded in. This manner of construction is not usually as satisfactory as we would like to have it, so for some time I have been trying to find a way to decrease the time and cost of dies for laboratory usage.

After some experimentation and study, I have succeeded in developing dies to do the necessary work; yet, through adoption of this method, the dies cost little more than it would cost to make the first piece by hand. To illustrate the solution, let us consider the routine of making a sample of what now is the Westinghouse TE-4 toaster.

In Fig. 1, *A* represents steel plates $\frac{3}{4}$ in. thick. These plates are cut small enough to clear *B* easily. The thickness of these combined is equal to the depth of the draw. *B* is a pressure pad made of celotex with a clearance hole for *D* which is the punch. The pressure pad should be built up about a fourth more than the depth of the draw. The punch for this die is made of fine-grained hardwood, cut to the inside dimensions of part to be made. *C* is the pressure plate made of $\frac{1}{16}$ in. steel sheet with a hole cut in the center clearing the punch. *E* is the die plate made of $\frac{1}{8}$ in. boiler plate with the center hole cut to the outside dimensions of the part to be made. The inside edge needs no finishing other than filing and radiusing the upper edge. *F* is a hardwood support for the die plate; the hole in this support is cut slightly larger than the hole in the die plate. The die plate and support are fastened together with wood screws. None of these or following die parts require hardening or grinding.

To make a base with this die lay the blank on the die plate approximately in the center. Insert the pins in the die support through the die plate. Put the pressure plate and pad on next. The pins line this assembly so when the punch is dropped into the pressure pad and plate it will naturally follow centrally into the die plate. The punch and one of the *A* plates are now added. This assembly is then put under a flat press and pressure is applied. The pressure pad is compressed the fourth it is thicker than the punch; therefore,

the pressure on the blank is even before the punch starts moving down. One of the plates *A* is now added every time force is applied until the proper depth is reached.

When the draw is completed, the offset is put in by pushing the formed base, with the punch still intact, into a hole in a plate that is similar to the die plate except that it has a hole cut to the dimensions of the upper offset. No pressure pad, plate or any of plates *A* are needed on this operation. Trimming is then done by hand. The holes and slots are also laid out and cut by hand. This completes the base.

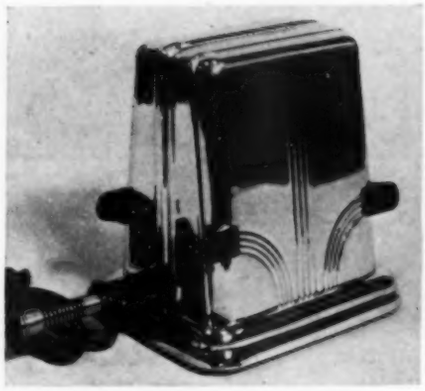
Procedure for the Center Band

In Fig. 2, *A* and *B* are made from a piece of sheet steel the thickness of the depth of the emboss. *C* is made of the same material. The hole in *C* and parts *A* and *B* are the only ones that require hand sawing and filing. *D* and *F*, made of the same material, are sheared to size. *E* and *H* are pieces of round cold-rolled steel bar of the diameters required to give the radii needed. *G* is a piece of rounded-edge steel strap. *C*, *D* and *E* pieces are soldered to *F*.

To make the center band, put the emboss in a rectangular piece of steel of ample size for the finished blank. To do this lay out holes to match *A* approximately where they come on finished blank. These holes are then lined up with holes in the die, and the die and the blank are clamped together in this position. *B* is now pressed into *C*, leaving indentations of *E* that are used as guides for *G* and *H*. *G* is pressed between *E* and *E*. Next *H* and *H* are pressed between *E D E D*. We now unclamp the blank from the die, turn the blank over and with *B* intact press *A* into *B*. The blank was then laid out by means of a predetermined templet. Forming the blank was accomplished by bending it over a wooden form cut to the inside dimensions of the finished band.

Trays and Handles

The tray die and its application is similar to that for the base except the die plate *D* is ¼-in. boiler plate and the punch *A* is aluminum cast to size. The emboss grooves were cut after the casting was made. Although no pressure plate was used on this die, no trouble was encountered with wrinkling because less clearance was allowed between the punch *A* and the die plate *D* than the thickness of the metal being drawn. The result of this was to draw the metal tightly over the punch which it did very nicely. The slight minus variation was absorbed in the die plate and support because of their light construction, which here is an advantage. This type of die can be used only where the draw is shallow; in this case, it was ½ in. The dotted line represents the bottom of the tray when completed. The spots which locate the centers of the curved embosses came below the bottom of the cover; hence the center pin of emboss die *B* was inserted in a hole drilled at this spot. The vertical embosses were put in by means of round pieces of steel rod soldered to a steel plate *C* ⅛ in. thick. The blank on this part was cut out at the lower end the height of the punch before pressing it into die. This was to serve as a guide for the top edges where the corners were being drawn.



Finished electric toaster, parts for which were produced with the temporary dies described

The handles were carved of wood and painted black. The bread support and inside parts were straight layout, hence no dies were used.

I have never found a job where drawn parts, needed on a small scale, which can be made in one operation and which use steel not over ⅛ in. in thickness, cannot be satisfactorily made on dies so constructed. As proof of my statement, I have made with such dies rectangular waffle iron covers, sandwich toaster covers, sad iron covers, which are about as hard a single draw encountered for the depth of the draw, and others.

An Improved Micrometer Discussion

WILLIAM S. ROWELL

Probably few veterans who have learned to use a micrometer skilfully will wholly agree with C. W. Hinman on the merits of the micrometer described by him (*AM*—Vol. 78, page 291).

The mechanical faults of design in reputable micrometers are not at all glaring, though present. To widen the distance between barrel graduations because at the present distance they cause squinting, and then to introduce thimble graduations that are closer together does not help at all. If the thimble graduations are at the same distance apart as on the present micrometers (about 0.055 in.), then a micrometer having a 10-pitch screw and reading to 0.001 in. would require the thimble to be more than 1¾ in. in diameter. This would be impossible in an all-purpose tool.

While it is agreed that with a micrometer having a 10-pitch screw, the endwise movement of the spindle is much quicker than if the screw were 40 pitch, with the present micrometer, a few quick strokes of the thimble on the forearm will move the spindle an inch in four or five seconds.

Jamming will not occur if the micrometer is handled correctly. All too frequently one sees a micrometer being used as a snap gage. It is set and locked, if it has a lock; then tried with more or less force on the work. The correct way to use a micrometer is to close it gently on the work, moving it slightly to be sure of proper contact and pressure; then to read it. That is what the graduations are for.

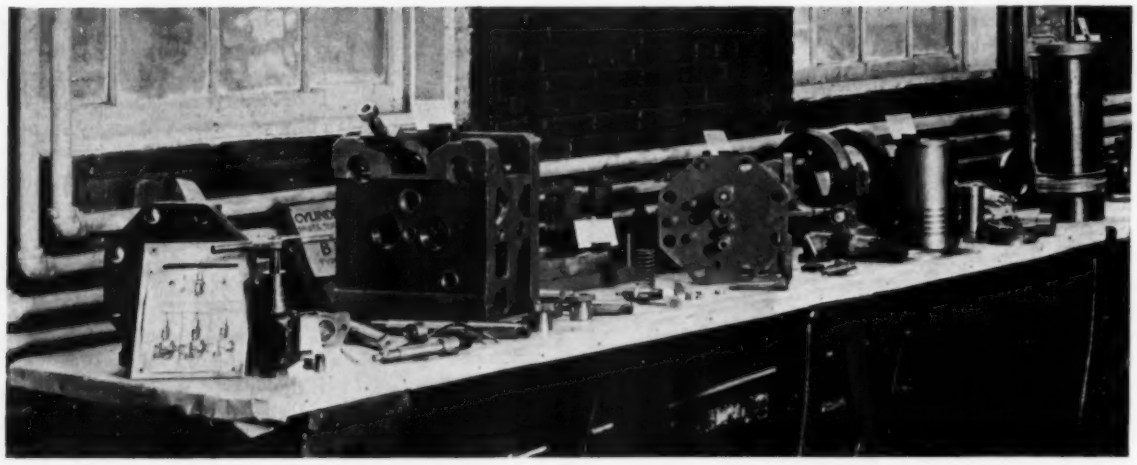
Toolholders and Tools For Planers and Lathes Discussion

J. H. DAVIS
Mechanical Engineer,
Wembley, Middlesex, England

While the toolholders described by William C. Betz (*AM*—Vol. 78, page 190) are of interest, they have some faults. The one in Fig. 1 holds the toolbits rigidly, but there is not by any means sufficient room to permit the chips to get away.

The toolholder in Fig. 4 is not suitable for rapid manipulation in a modern toolroom lathe, such as is afforded by a regular toolpost. The holder for the cut-off tool in Fig. 7 would be unsuitable as a spring toolholder because the point from which the tool springs is below the cutting edge and will permit the tool to dig into the work instead of springing away from it.

According to Mr. Betz, the tool in this holder can be used for threading if it is ground to the correct angle, and the holder can be swiveled for cutting threads of coarse pitch. Swiveling the holder is all right provided the top of the tool is ground level and is in line with the axis of the work. If the top of the tool is not level, an incorrect thread will result.



Among the tools used for Worthington diesel parts is the box jig for the cylinder head shown at the left. Further down the bench may be seen a piston, the fixture which supports it when the wrist-pin hole is bored and the wrist-pin hole reamer. At the right is a cylinder liner

Interchangeability in Diesel Engine Manufacture—II

JOHN HAYDOCK
Managing Editor, American Machinist

In the last number, Worthington practice was exemplified by a description of the machining operations on the bed plates and main frames. The following tells of the way in which cylinder heads, cylinder liners, pistons, rods, and camshaft housings are handled

CYLINDER head castings are first put on a Bullard vertical boring mill where the joint face and fit diameter are rough and finished faced and turned. After inverting, the top is faced on the same machine. From the Bullard, the heads go to an Ingersoll rail-type four-head milling machine, where they are set up on a fixture which positions them from the fit diameter. Two castings are machined at one time on the inlet, exhaust and air starting pads. The cylinder heads are then set on the same machine at 90 deg. to the first position. Here the side pads are milled, but only one casting can be machined at a time because the cutter must stop against the flange. Two heads are used on both operations. The heads are then completely drilled, reamed, counter-bored and tapped on a radial drill. A box-type drill jig is used with combination reaming and counter-boring tools for this operation.

Cylinder liners are made of a special mixture nickel iron. They are first rough machined all over on a Libby turret lathe and then set outside for a three to five month seasoning period. After seasoning, the liners are finished bored, counter-bored and faced on a horizontal boring mill using a three-point bearing fixture which prevents distortion. For finish turning the liners are mounted on center plates in an engine lathe. The flange and fit diameter are also finished in this operation. Pockets for valve clearance are bored on a radial drill with a special cutter and fixture. Drilling and tapping the holes for eye bolts, used for installing and removing the liners, completes the machine work.

Pistons also are made of a special mixture cast iron and are first completely rough turned, faced and grooved on an American engine lathe. After seasoning, the piston is chucked at the head end, the outside diameter is turned to grinding size, the grooving is finished, and the skirt end finished, faced and bored for a center plate. The piston is then chucked on the skirt end over a center plate, a steady rest supporting the other end. In this set-up the crown, which has a special contour, is finished.

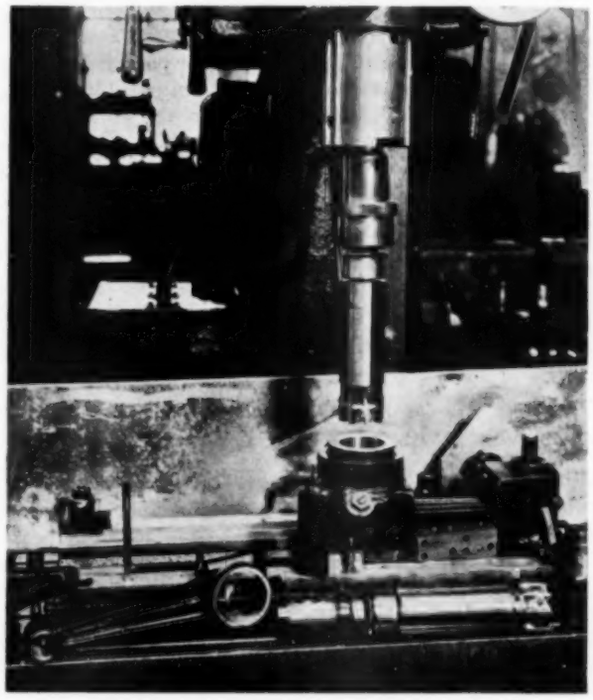
To form the crown a special attachment is used whereby the tool is guided by a cam slot in which a roller follower operates. Transverse motion is provided by the regular lathe cross feed screw. The cutting tool is held in a sliding block on the regular toolpost, and with the roller guide block rigidly connected to the lathe bed, the irregular shape milled into the roller guide is reproduced on the crown of the piston. To overcome the steep rise on the outer diameter of the piston, which cannot be produced by the roller and roller guide

Camshaft housing bores are located by means of the fixture at the right, and the holes are drilled in the rotary box jig just behind it. At the left is shown a main frame with two plate jigs

without putting a terrific strain on the entire mechanism, a pneumatic booster is employed. It consists of an air cylinder with a double acting valve connected with the sliding toolblock. By opening the valve in the proper direction, depending upon whether the tool is fed toward the center or outward, the roller is held by air pressure against the side of the roller which offers the least resistance, thereby producing a well finished, accurate contour.

The wrist-pin hole is bored, counter-bored and the inside faces of the bosses machined on a Bullard vertical mill. The piston is clamped rigidly in a fixture that is bolted to the table, locating from the outside diameter of the piston and the crown end. While the work is still in place in the fixture the hole is hand reamed with a special two diameter helical reamer, assuring the uniformity of all wrist-pin holes. A clearance in the crown for the valve head is then cut on the same machine by placing three pistons horizontally and spotting them simultaneously with a boring bar. The next operation is to put an angular key-way in the wrist-pin hole by means of a slotter with an inclined fixture.

After jig drilling the lock screw and eyebolt holes on a radial drill, the piston is taken to a Landis cylindrical grinder where the outside is finish ground. In order to insure absolute squareness, in addition to previous precautions taken with this work, an adjustable center is used. In setting up the piston, an arbor is placed in the wrist-pin hole with a light drive fit. Then by means of a dial indicator, first one side then the other is checked and the center adjusted until both readings are identical. In this position the center is locked and the piston ground to its finish dimension. A slight taper, which is specified just above the rings, is ground during the same set-up by swiveling the wheel to the desired angularity and taking another cut. The eccentric relief across the wrist-pin bosses is cut on a lathe with an offset fixture. One setting is needed for each side. The sequence of operations is selected to reduce any possibility of distortion.



While this set-up shows the boring of compressor connecting rods, the operation on diesel rods is very similar. However, in the diesel design only the wrist-pin hole is integral with the rod forging

Connecting rods, which are of the separate crank-pin box type, are made from medium carbon steel forgings. They are first core drilled on a Baker single spindle upright drill. The forging is then placed in a swinging drill jig with two index positions under a radial drill. This operation includes drilling and spotfacing the bolt holes for the crank-pin box, spotfacing the dowel fit to the correct length, drilling the oil hole through the length of the rod, drilling, tapping and counter-boring for the wrist-pin bushing lock screw and centering. The rod is then put in an American engine lathe, on centers, the stub end is faced and the dowel fit diameter rough and finished turned. The rod is then returned to the radial drill to finish ream the bolt holes. Locating from the stub end and the reamed bolt holes; the rod is again set up in a fixture on the Baker drill and the wrist-pin hole finish reamed, leaving 0.005 to 0.008 in. for grinding. The wrist-pin hole is then ground to finish size, again using a fixture for positive location while grind-

By use of an adjustable center and a arbor fitted into the wrist-pin hole, the piston is carefully indicated to insure squareness before being finish ground

ing. This operation of grinding is one of the many refinements employed to insure precision and interchangeability.

Camshaft housings are made ready for assembly by three planing and two drilling operations. They are first set up in two rows to rough and finish plane the joint or surface that is bolted against the frame, and the bottom face which has an accurately machined recess for the camshaft bearings. Then the castings are turned over to rough and finish plane the fuel pump pads and the front side. Four heads are used on both operations. Next the housings are set cross-wise on the planer table to finish the ends by taking cuts simultaneously with two heads. For the next operation, the housing is put into a rotary box drill jig with four index positions, one for each side. Here the housing is completely drilled, reamed, the bronze bushings are driven into place and finish reamed without taking the work out of the fixture. Tapping and spotfacing is done on the same machine (a radial drill), but after the housing has been removed from the jig. The last operation is done on a horizontal drill. Both ends are drilled and tapped in this setup.

These operations, which describe the work performed on the main parts of the Worthington diesel serve to give an idea of the procedure employed to combine interchangeability of parts and accurate workmanship. The same principles apply to the many other components that go to make up the completed engine. It should be remembered that the number of engines produced of any one given size is comparatively small. However, by careful attention to design and preparation for manufacture it has been possible to approach mass production on work that would otherwise use essentially jobshop practice without the benefit of interchangeability and the increased accuracy obtainable only through the extensive use of jigs and fixtures.

Sharpening Files Discussion

J. M. MURPHY
Industrial Engineer

I would like to correct your correspondent who comments (*AM*—Vol. 78, page 281) that file sharpening is impractical. I have a cost analysis record of results obtained in a 5,000-man plant which speaks for itself. He perhaps based his views on the cheaper files, such as small mill, second cut, and the like. When these get more than normal use, are broken or teeth sheared off there is no possibility of reclaiming them.

The largest savings can be made on Vixen type and large tooth, more expensive files, provided they have had only normal wear and not abuse. The costs I have are based on the use of a small steam outfit used in sand blasting these files. This sharpened 2,962 files at a cost of $157.32, a saving of $1,571.61 in one month. The yearly savings were $59,968.30.

The shallow tooth files such as mill, bastard and similar types can usually be resharpened from two to four times with good results. The Vixen type files can be resharpened as many as eight or ten times, depending upon condition.

The cost of reclaiming files runs from two or three cents for a small mill or bastard file up to six to eight cents for a Vixen. Sandblasting is not only quite practical in reclamation work but a large percentage of new files of better grade are sandblasted.

Up to Industry Discussion

A. W. FORBES
Forbes & Myers

Your editorial (*AM*—Vol. 78, page 380a) asks: "But does industry want codes, and if so does it want them enough to take an active part in policing them?" It is hard to answer this question, on account of the extreme difference of opinion, but the nearest approach to an answer that I have seen is in the report of a questionnaire sent out by the New England Council. Nineteen hundred and fifty forms were sent to New England manufacturers, among the questions being whether they were helped or hurt individually by the codes. Of the replies 107 said they were helped and 163 said they were hurt.

These numbers are not large enough to be taken as proof, but the fact that of the replies such a majority said they were hurt shows that there is an important sentiment against the codes. What is more significant than the numbers is the bitterness of the opposition.

Whatever the facts may be, there is a feeling that the codes are put over by big business for the purpose of gaining power for themselves, for building up monopolies and for the destruction of their competitors. I have never heard the amount of talk against big business that I have heard lately, and it is much more virulent than formerly. The codes are introducing a spirit of distrust between business men that is conceiving ulterior motives for every business move. So whatever other effect the codes may have, they are building up a spirit of antagonism and suspicion that must long delay the progress of true cooperation.

We must recognize that the codes have some merits, but whether the majority of business men thinks that the actual practice of the codes would be good or not, I would suggest that the restoration of confidence and the spirit of cooperation is more important than any benefits the codes may give. Without this cooperation their enforcement must require an army of detectives, and cooperation appears to be impossible under the present codes.

EDITORIALS

VOLUME 78 **AMERICAN MACHINIST** NUMBER 13

ESTABLISHED 1877

MCGRAW-HILL PUBLISHING COMPANY, INC.

K. H. CONDIT F. H. COLVIN

EDITORS

A Good Sign

GREAT improvement in the proportion of engineering graduates who have secured jobs is a sure sign of industrial recovery. A year ago the senior who had a job lined up was the notable exception and the envy of his classmates. This year finds the majority of the embryo engineers with jobs, and some of the outstanding men with several from which to choose. And what is even more encouraging, most of last year's graduates have already been placed.

Most of the jobs, it is true, do not pay as much of a starting salary as those of four and five years ago, but that would hardly be expected in view of the drastic cuts in all salaries, many of which are still in effect. But the size of the starting salary or wage is not vital. The important thing is that industry recognizes the value of the technically educated man and has recovered to the point where it is hiring him with an eye to the future. Several companies with which we have close contacts are starting mechanical engineers as machine operators with gratifying results. Their trained minds grasp principles quickly and their progress is correspondingly rapid. They will be the foremen, the superintendents and the works managers of a few years hence, and they will be good ones. In the meantime they fill the gaps caused by the desertions of skilled operators with families to support who have been forced to seek steadier jobs than the machinery industries are able to guarantee.

Interim Education

NOW THAT our Congressmen have ended their deliberations and scattered to their homes to explain it all to their constituents and make sure of being returned, industry will breathe more easily as it adjusts itself to the new laws that are on the books. It is a trite but true statement that you can adjust yourself to almost any given set of conditions, no matter how bad, but that it is humanly impossible to conduct a profitable manufacturing business when conditions are changing constantly and without warning.

During the interim between the end of this Congress and the assembling of the next industry has an educational job to do. As Herman H. Lind, general manager of the National Machine Tool Builders' Association, pointed out again at the recent meeting of that group, the average Congressman means to do the right thing but is woefully ignorant of many of the problems of industry. He is perfectly willing to be educated on industrial questions, but in view of the many other demands on him he can hardly be expected to take the initiative in seeking such education. The initiative must be taken by individuals in industry. They should invite their respective Congressmen to visit their plants this summer to see how machinery is made and how it is distributed, and incidentally how far from a full measure of recovery the average plant making capital goods really is.

George H. Houston, chairman of the Durable Goods Industries Committee, has remarked that the next Congress will have more important legislative decisions to make than the present one had, because it will have to deal with permanent rather than emergency measures. What is to succeed NIRA when that statute expires by limitation a year from now? Are the anti-trust laws to remain as they are, or will they be modified? Will control of stock exchanges be strengthened or relaxed? What kind of labor legislation will be passed? What is to be done about old age pensions and unemployment insurance? These are but a few of the questions that must be settled. If you expect your Congressman to represent you and your opinion it is only fair to assume the responsibility of informing him fully about that opinion and why you hold it.

NRA's Birthday

ON THE eve of the first anniversary of the National Industrial Recovery Act, plans were announced for drastic simplification in its set-up and in its administration. According to the projected program four hundred and fifty codes would be consolidated into twenty-five with corresponding reductions in code authorities and other supervisory groups.

Coming fast upon the heels of the relaxation of NRA regulation in the service industries, this proposal clearly foreshadows a major change in policy. Of necessity, it means that many of the now existing trade practice provisions will be recast into such general terms that little of the codes will remain but the restrictions in hours and wages. Industrial executives who still hold the "partnership" idea concerning NRA may be disappointed in a trend that points toward a discarding of industry's "rights" in its fight against uneconomic competition while retaining concessions to the administration in minimum wages and maximum hours.

There are probably more, however, who will welcome the veering away from strict regimentation

envisioned in the new policy. In the past few months, in particular, the yoke upon business has raised problems for which there is little hope of permanent solution. It may well be that the second anniversary of this industrial experiment, which will mark the end of its specified duration, will offer a natural "out" to a program which can then be said to have "served its purpose."

Chicago Repeats

A YEAR AGO we departed from precedent by publishing a sixteen-page story on Chicago's gesture of defiance to the depression, A Century of Progress. When word was received that the exposition was to be revised, renovated and reopened this year we had our doubts but we decided to hold space for a short article on the new edition. The World's Fair of 1934 is so far beyond expectations that we are giving it double the space planned. Chicago is using the prize ring's famous "one-two" on depression. May she be successful.

.CHIPS.

Washington—Roosevelt signs Securities Exchange Bill with amendments softening the 1933 Securities Act . . . Reciprocal tariff measure is passed, and signed by the President . . . Secretary Swanson signs contract plans clearing the way for bids on 24 new ships for the Navy . . . Board appointed to make intensive study of strategic value of airships . . . NRA acts to eliminate price fixing by codes . . . Bankruptcy bill signed and actions under it are started at once . . . One big "clean-up" code planned to take care of scores of small industries under NRA . . . Darrow Committee takes another swipe at NRA and promises a third one . . . Tugwell proclaims his orthodoxy and sits and smiles as Democratic Senators call each other names at hearing . . . Wallace reports failure of crops by drought and Hopkins urges removal of 5,000 families from barren area in South Dakota . . . Hull note apparently opens the door for payments on war debts in kind . . . Air Mail Bill in modified form is signed . . . Housing plan offered as means to revive building industry . . . Silver Bill is passed.

Foreign—Led by Great Britain all foreign debtors except Finland default June 15 payments on War Debts . . . Bitter speeches at World Disarmament indicate irreconcilable differences and postponement until fall is agreed upon . . . Stalin, disturbed by inefficiency of Soviet railroads, orders a general shakeup and instructs heads of parts-making factories to give railway parts priority . . . Germany likes British debt note to U. S., prepares to use same arguments on British creditors . . . Standardization scores in British court circles as debutantes are limited to four model gowns to be seen at the chamberlain's office . . . Roosevelt likely to meet high Japanese officials at Hawaii this summer . . . Austrian Nazis set off more bombs . . . League of Nations admits failure of Chaco arms embargo . . . Italy to build two 35,000-ton battleships . . . Nazis disband the last remnants of the Steel Helmets . . . German soldiers violate treaty by entering Rhine neutral zone . . . Hitler consults Mussolini in Venice.

Finance—Wall Street lawyers meet to analyze terms of new securities act which is expected to release many important refinancing programs . . . French financial circles are discounting collapse of German mark . . . Big New York banks completing separation of security affiliates . . . Treasury offers oversubscribed more than eight times . . . Bank of U. S. directors must pay $28,000,000 . . . Nine New York clearing house banks agree to pay their share of Harriman bank losses . . . National debt reaches "all-time" high of $27,000,000,000.

Industry—B. & M., Budd and General Motors join forces in research on trains of the future . . . Steel prices for third quarter are unchanged from those of second quarter . . . Building contracts up in May . . . Threatened steel strike holds spotlight in industrial world as employers agree to board like the Automobile Labor Board but labor leaders refuse . . . Norris-LaGuardia anti-injunction law upheld by Circuit Court of Appeals, appeal to be taken to Supreme Court . . . Congress passes Wagner Bill substitute providing for mediation boards and unbiased elections to determine employee representation.

Trade—Japan building six 18.5-knot freighters to carry growing trade between the Orient and New York . . . Dr. Claudius T. Murchison, professor of economics at the University of North Carolina, sworn in as director of the Bureau of Foreign and Domestic Commerce . . . Refrigerator sales are setting new records according to reports from Westinghouse and Leonard . . . Opening of Dotsero Cut-off puts Denver on through rail route, shortens time to the Coast . . . Foreign Trade Adviser Peek reports that we lost $22,000,000,000 in 38 years of foreign trading because we couldn't collect.

Indicators—Steel production at 61 per cent of capacity, up one point, according to *Iron Age* . . . Electric power production drops slightly but is 7 per cent ahead of last year . . . *Business Week's* index rises to 66.3.

Auto Strike Threats Fade with Schedules

DETROIT—At mid-June the automotive picture is one of conflicting tendencies. A marked reduction in output was anticipated and will doubtless materialize, but recent price reductions in Chevrolet, Plymouth, Dodge, Oldsmobile, Pontiac, Graham and Terraplane may serve to stay the decline. General Motors show week in 60 cities closed Saturday, June 9; while sales figures are not yet complete there is evidence that they will be gratifying. Attendance was lower than for the 1932 show, caused by extremely hot weather during the first few days of the week, but sales were markedly better and continued progressively to run ahead of 1932 as the week advanced. Prospects for all General Motors products also showed a substantial increase over 1932. The feeling is that this is tangible evidence that conditions are improving.

At present plans call for a production for June of about the same as a year ago, namely, 260,000. May production will not be far from 350,000 according to *Cram's* reports; April production was 378,983.

Programs for 1935 models are still in the experimental stage. No extensive equipment purchases are in prospect for the months of June and July, but it is anticipated that programs will be far enough advanced by September to make extensions necessary. The question which still exists as to the holding of the January auto show seems to presage a late introduction of models, later than last year. The alternate plan suggested by N.A.C.C. of having dealer shows in 100 cities sometime in February and March is still under consideration. Labor troubles in tool and die plants last fall are only a partial explanation for the proposed change; mid-season shows, the expense and last minute rush to be sure that each maker has all the gadgets of his competitor, which entails considerable hand work, are factors to be considered.

At present there is no labor trouble in the industry or in prospect. A period of reducing schedules with layoffs common is not conducive to strikes. The layoff policy announced by the Automotive Labor Board May 19 was timed to cover the current reduction period. While this plan is devised to protect seniority rights, it exempts employees whose work in the judgment of the management is essential to the operation of the plant and production, or who have special training and ability. Some difficulty is reported in following this plan in the last two weeks in that charges of discrimination may easily arise in necessary adjustments of force where such is not intended. The president's settlement, the Labor Board and its layoff policy offer ample protection to the rights of labor and should be given a fair trial before being cast aside for another experiment.

Inventories of steel in many cases run to a 60-day supply though this inventory is due to the code price situation in the second quarter rather than to anticipated labor troubles.

Tool and die shops in Detroit are hoping that their labor troubles of last fall will not be repeated when work on 1935 models begin in earnest. Their problem is to convince the automobile makers that such will be the case. While experience with work done outside last fall was not entirely satisfactory if the policy is repeated enough times outside shops will become sufficiently familiar with automotive requirements as to make the industry indepent of Detroit shops.

One large parts supplier reports that operation of the plant of about 4,000 employees almost equally divided between a company union and an A. F. of L. local is giving no difficulties. Two months ago there was considerable feeling because of the belief that the industry was to go closed shop and in that case the union men would have a preference as to jobs. With the President's settlement this feeling subsided and friendly rivalry took its place.

Nicholas Dreystadt becomes acting general manager of the Cadillac Motor Co. while Lawrence P. Fisher has been transferred to General Motors operating staff; V. A. Olsen is made works manager.

W. H. Bassett Nominated for A.S.T.M. Presidency

William H. Bassett, metallurgical manager, the American Brass Co., has been selected to head the slate of officers of the American Society for Testing Materials for 1934-35. Other nominations are vice-president, H. S. Vassar, laboratory engineer, Public Service Electric & Gas Co.; members of executive committee, H. A. Anderson, metallurgical engineer, Western Electric Co., Hawthorne Works, H. J. Ball, professor of textile engineering, Lowell Textile Institute, W. M. Barr, assistant to executive vice-president, Union Pacific Railroad Co.; L. S. Marsh, manager, Department of Inspection and Metallurgy, Inland Steel Co., J. B. Rather, in charge, general laboratories, Socony-Vacuum Corp.

Official notification of election will be made on June 26 at the A.S.T.M. annual meeting.

C. E. Adams Made NRA Division Administrator

Succeeding Kenneth M. Simpson, who resigned, Charles Edward Adams was recently appointed as division administrator in charge of Division I of NRA. Mr. Adams is president of the Air Reduction Co., chairman of the United States Industrial Alcohol Corporation and an officer or director in several other firms. He has served as deputy administrator in charge of finance and insurance codes.

High Speed Train for Boston & Maine

Two hours will be cut from the running time between Boston and Bangor by the installation of a high speed, lightweight, streamlined train to be operated jointly by the Boston & Maine and Maine Central Railroads. The train will be built of stainless steel and comprise three cars, a driving unit with baggage and express compartment, a day coach and a parlor coach with buffet dining service. An extra car will be built for reserve use. Power will be furnished by electric motors actuated by a diesel driven electric generator.

Governor Louis J. Brann of Maine was active in urging both railroads to put the new train into operation to give better service for business travel between Boston and the Maine cities and to bring the resort regions of Maine closer to the large eastern centers of population. The train will be part of the new equipment to be built with the $2,628,000 allotment previously made to the Boston & Maine for construction of steel cars and engines. It will cost approximately $275,000 of which $220,000 will come from the PWA.

According to a late announcement by Public Works Administrator Ickes, a loan of $2,000,000, granted to the Illinois Central Railroad, will also include a high-speed, streamlined train.

Congress Passes Labor Disputes and Industry Loans Bills

During its unsuccessful effort to adjourn last Saturday Congress passed two bills of direct interest to industry—the Labor Disputes and the Industry Loans bills. The labor bill was substituted for the controversial Wagner measure and represented a compromise to avoid indefinite prolongation of the session.

Although the Wagner bill had a number of supporters, including Senator LaFollette, the opposition to the substitute measure withdrew upon the request of Senator Wagner himself who pointed out that the President did not consider the time opportune to force the issue on the original bill.

The legislation as passed is temporary, being effective for only one year. It permits boards established by the President to hold employee elections in an atmosphere free from coercion in accordance with Section 7a of the Recovery Act. An amendment proposed by Senator LaFollette, stating that nothing in the measure was to be construed as preventing the right to strike, was adopted.

Differences in the Industry Loan Bill were ironed out and the conference report finally accepted. Under the measure as passed $580,000,000 is made available. Reserve banks are empowered in the first instance to make loans to industry up to $140,000,000, the amount of their present surplus. At the discretion of the Secretary of the Treasury, an additional $140,000,000, which represents the half of the surplus which was subscribed as stock in the Federal Deposit Insurance Corporation, may be restored to them by use of the Treasury's gold devaluation profit.

The Reconstruction Finance Corporation is authorized to loan up to $300,000,000 for the same purpose, presumably under more liberal terms.

Major Clay Named for Forged Tool Authority

Major W. L. Clay, U. S. A., assigned to special field duty in connection with Army procurement and planning activities, has been appointed as government representative to the code authority of the forged tool manufacturing industry. Other recent appointees to represent the government in the administration of codes in the metal-working industry are:

Metal-Working Code Hearings Scheduled

Date	Place	Deputy Administrator	Association
June 25	Washington Hotel	W. A. Janssen	American Alloy Producers
June 25	Shoreham Hotel	K. J. Ammerman	*Wheel & Rim Manufacturing
June 25	Shoreham Hotel	K. J. Ammerman	*Oil Filter Manufacturing
June 25	Shoreham Hotel	K. J. Ammerman	*Internal Combustion Engine Manufacturing
June 25	Shoreham Hotel	K. J. Ammerman	*Powdered Metal Bearing Manufacturing
June 25	Willard Hotel	W. G. Hooke	Steel Plate Fabricators (Amendment)
June 26	Shoreham Hotel	K. J. Ammerman	*Automotive Gasket Manufacturing
June 26	Shoreham Hotel	K. J. Ammerman	*Carburetor Manufacturing
June 26	Shoreham Hotel	K. J. Ammerman	*Radiator Manufacturing
June 27	Shoreham Hotel	K. J. Ammerman	*Automotive Electric Lighting & Reflective Devices Manufacturing
June 27	Shoreham Hotel	K. J. Ammerman	*Spark Plug Manufacturing
June 28	Shoreham Hotel	K. J. Ammerman	*Automotive Shop Equipment Manufacturers
June 28	Shoreham Hotel	K. J. Ammerman	*Piston Ring Manufacturing
June 29	Shoreham Hotel	K. J. Ammerman	*Replacement Valve & Valve Parts Manufacturing
June 29	Shoreham Hotel	K. J. Ammerman	*Replacement Automotive Water Pumps and Parts Manufacturing
June 29	Shoreham Hotel	K. J. Ammerman	*Replacement Piston and Pin Manufacturing

*Supplement to Automotive Parts and Equipment Manufacturing Industry.

Woodworking machinery industry and beater, jordan and allied equipment industry—G. E. Putnam, economist and manager of research department, Swift & Co.

Machine screw and nut manufacturing industry, drapery and carpet hardware manufacturing industry and the wood screw manufacturing industry—Emmett B. Carter, former vice-president and works manager of the Delaware Floor Products Co.

Wire machinery industry and the abrasive grain industry—F. E. Barth, vice-president and assistant general manager, Graton & Knight Co.

Water meter manufacturing industry—A. A. Ainsworth, trade association executive, formerly western manager of the David Williams Companies.

Screw machine products manufacturing industry—Isham Keith, formerly with the Bethlehem Steel Co.

Silverware manufacturing industry and the watch case manufacturing industry—Joseph V. Necas, P. Lorillard Co.

Bright wire goods manufacturing industry—R. P. Barry, former private secretary to Stuyvesant Fish.

Stone finishing machinery and equipment industry—David Newhall, former sales agent of steel cars and auxiliary locomotives for the Bethlehem Steel Co.

Porcelain enameling manufacturing industry—E. G. Vail, formerly vice-president of the Gurney Refrigerator Co., to succeed Sam T. Johnson, deceased.

Can labeling and can casing machinery industry—Alfred E. Waller, former assistant director of sales, General Cable Corporation.

Canning and packing machinery industry—W. H. Calhoun of Sears, Roebuck & Co.

Liquefied gas industry, bicycle manufacturing industry and the mechanical packing industry—Clarence G. Spencer, engineer, Baker & Spence, Inc.

Machinery and allied products industry—H. P. Dutton, professor of factory management, Northwestern University and associate editor of *Factory Management and Maintenance.*

Standard steel barrel and drum manufacturing industry, steel package machinery industry and washing machine parts manufacturing industry—L. E. Connelly, former vice-president, D. Connelly Boiler Co.

Milk and ice cream can manufacturing industry and galvanized ware manufacturing industry—W. C. Connelly, director of the Cleveland Chamber of Commerce.

Paper box machinery industry—Alfred E. Waller, formerly chief engineer of the Ward Leonard Electric Co.

Export Associations Advised to Promote Foreign Trade

R. E. W. HARRISON
Chief Machinery Division
Bureau of Foreign and Domestic Commerce

WASHINGTON—Aggressiveness on the part of individual manufacturers,. particularly with respect to export trade, a planned program and government credit aid are the remedies required to put American machinery exporters back in their position of superiority in world trade.

For many years the United States has enjoyed the foreground of the world trade picture. This position was attained by superiority of high production technique built up by capable men and good machinery.

Competition for world trade, with the added competition against economic forces which must be waged within to maintain previous high standards of living, dictate that those who go down into the markets to trade must not only have bullet-proof armor but weapons which will outreach and out perform in every way those of competitors.

We are going down into the market places of the world at present with our chief weapons sorely blunted, our skilled labor dissipated to the four winds, and our production machinery rusty and out of date.

On the other hand consider what has happened in the camps of our principal competitors. Under the stress of adversity caused by the results of the world war these people had to get busy or die. They did not die and it is needless to say they have been extremely busy.

Machine tools produced today in Germany, England, and to a certain extent in France, are more nearly on par with our own than ever before. This applies not only to machine tools, the keystone of manufacturing industries, but to almost every type of production machinery.

We need a plan of action and export facilities equal to or better than those available to our competitors. We need a real scheme of distribution for manufactured goods which will place them in the furthermost corners of the earth at the lowest possible cost and with the best possible presentation.

An export trade association based on the cartel arrangements of foreign competitors can be set up under the Webb-Pomerene export trade law administered by the Federal Trade Commission. These trade bodies are exempt from operation of the anti-trust law as far as their export actions are concerned. They would also give a better bargaining organization to the trade for functions under the reciprocal tariff powers now invested in the President. In the past five or six years foreign nations have consummated about 130 trade agreements and the United States has been party to none.

Some years ago, leading British machine tool builders were faced with precisely the same problems besetting the American trade today. They had the added burden of only a 40 per cent domestic demand, leaving 60 per cent of their production to be disposed of.

A group of about twelve of these British manufacturers, each specializing in one particular type of machine tool, formed an association, the capital of which was subscribed by the member companies. The mission of the association was to sell the products abroad at the cheapest possible rate. Experience has proved the wisdom of this move, and the results obtained represent the cheapest and most efficient form of distribution which could be devised.

Code Authorities to Handle Trade Complaints

Code authorities for the textile machinery industry and the copper and brass mill products industry have been empowered to handle trade practice complaints, according to an order signed by Acting Division Administrator Barton W. Murray. Complaints by competitors of non-observance of labor clauses of the codes are classed as trade practice complaints.

R. L. Templin Awarded Dudley Medal

Winner of the Charles B. Dudley Medal for 1934 is R. L. Templin, chief engineer of tests, Aluminum Co. of America. Presented annually by the American Society for Testing Materials, this medal is awarded to the author of the paper given at the preceding annual meeting which is of outstanding merit and constitutes an original contribution to research in engineering materials.

Mr. Templin's paper, entitled "The Fatigue Properties of Light Metals and Alloys," described a new type of direct tension-comparison fatigue machine and gave important fatigue data on many commercial light alloys. Formal award will be made at the A.S.T.M. annual meeting in Atlantic City, June 25-29.

• INDUSTRIAL REVIEW •

• Orders and inquiries for machinery and machine tools subsided still further during the first half of June. The threat of a steel strike unquestionably had a lot to do with the reluctance of manufacturers to make commitments for equipment, which has mounted to a point where some observers are beginning to call it a "capital" strike. Most of the men in the machinery industry are still hopeful for a considerable improvement by September.

• In the Eastern territory June business has been somewhere near the May level. Most of the distributors have prospects on which to work, however, and the result at the end of the month may not be so bad. As for Pittsburgh it may be expected that things will loosen up a bit now that the steel "holiday" has been at least postponed. Cleveland has experienced a drop in the first half of June that was unexpectedly severe. The threat of the Wagner Bill and fear of the compromise substitute are held responsible.

• Business is at a low ebb in Cincinnati. It is so low, in fact, that some plant managers are thinking of shutting down as early as July 15. Michigan is seething with politics, and business in equipment and supplies is getting down near the 1933 level. Extreme economy is the rule where machine tool purchases are in prospect and few are being made. Business in the Chicago territory is very spotty but a few orders are being taken. Inquiries in St. Louis are fewer than at any time this year but labor troubles seem to have subsided. Milwaukee is in about the same situation. Labor agitators are active.

May Machine Tool Figures Are Off Slightly

Continuing the down trend that started in January, May orders for machines were off to 45.9, according to the supervisory agency's index as against 46.5 for April. The extent of the loss is much less than might have been expected from preliminary reports of diminished sales. As shown in Table II companies reporting year's sales in 1926 above $200,000 and those below this figure were affected in the same degree.

With the best volume of the year to date, foreign orders held up well, comprising 23 per cent of the total.

On the whole the distribution of orders is improving despite the lower volume. While fewer companies show business better than 1926, a greater percentage is doing better than half the base figure as shown in Table III.

TABLE I—INDEX OF ORDERS BASED ON VOLUME OF SHIPMENTS FOR 1926

Month	No. of Reports	Avg. Monthly Value of Shipments, 1926	Index of Orders			Per Cent of Foreign to Total Orders
			Total	Domestic	Foreign	
January	163	$8,084,351	53.7	43.9	9.8	18
February	163	8,084,351	50.9	40.5	10.4	21
March	163	8,084,351	48.1	40.1	8.0	17
April	163	8,404,416	46.5	36.2	10.3	22
May	160	8,280,603	45.9	35.4	10.5	23

TABLE II—BY SIZE OF GROUPS

Group A—Companies reporting year's sales in 1926 of $200,000 or more:

Month	No. of Reports	Index			Per Cent Foreign to Total
		Total	Domestic	Foreign	
January	82	54.0	43.5	10.5	19
February	82	50.7	39.5	11.2	22
March	82	47.2	38.8	8.4	18
April	89	46.2	35.3	10.9	24
May	88	45.8	34.6	11.2	25
Group B—Companies reporting year's sales in 1926 of less than $200,000:					
January	81	49.8	48.3	1.5	3
February	81	53.0	50.6	2.4	5
March	81	57.3	54.7	2.6	5
April	74	50.3	48.2	2.1	4
May	72	48.0	46.4	1.6	3

TABLE III—INDEXES OF INDIVIDUAL COMPANIES

	Number of Reports in each Index Group				
	January	February	March	April	May
100% of 1926 or more	21	20	21	21	16
50%—99%	29	32	36	33	38
Less than 50%	113	111	106	109	106
Total Reports	163	163	163	163	160

Code Price Provisions Under Study

Although the recent NRA announcement, laying down the principles of price and cost regulation, was qualified to apply only to future codes, it is well to take note that there is now in existence the Cabinet Committee, and its group of economists under Dr. Isadore Lubin of the Department of Labor, which is making an intensive survey of the effects of the price provisions of 263 codes. From this study, which is costing $50,000 of NRA money, may come a general revision of all pricing provisions.

The NRA price policy, issued after a year of study, may be summarized as follows:

1. No fixing of even minimum prices except in emergencies; emergencies to be declared only after full study by NRA economists, and then for only 90 days maximum.

2. Open price provisions, but without time lag; declared prices may not be increased after recording for 48 hours. Many codes contain open price provisions, with a five to ten-day period during which, General Johnson feels, intimidation is often used to bring the lower priced units into line.

3. Model cost finding and accounting systems may be recommended in codes, but may not be made obligatory; code authorities may not suggest inclusion of uniform additions, percentages or differentials designed to bring about arbitrary uniformity of costs or prices.

A survey made recently by the Research and Planning Division of NRA of the first 400 codes, found 263 codes and 23 supplements containing minimum price provisions, all but three of them providing that they be based on costs. Two codes provided basing points; one code required fixing of price by the code authority with NRA approval. Two hundred and six codes based costs on individual cost, nineteen said only "cost," sixteen codes and four supplements had other terms like "average," "lowest representative," "cost of lowest cost producer," etc. Seven codes have the approved "emergency" lowest reasonable cost provision, while nineteen had more than one kind of cost and six require overhead to be calculated.

Bausch & Lomb Will Open to Visitors

During the week of the Rochester Centennial, August 20-25, the plant of the Bausch & Lomb Optical Co., comprising over a million square feet of floor space, will be open to visitors. A schedule of trips under the direction of special guides is being arranged so precision operations and inspection may be viewed where limits are carried to millionths of an inch. In addition to the scheduled daylight trips, arrangements are being made to open the astronomical observatory each evening. Competent lecturers will be present.

Army to Build Air Depot

Award of a contract for the construction of a shop and hangars at the Air Depot, Middletown, Pa., has been reported by the War Department. When completed, this depot will form the Eastern repair and storage depot for all aeronautics under the War Department. At this site planes will be repaired and motors reconditioned. It will comprise one of a group of four air depots to be used by the Army Air Corps, the other three being in Ohio, Texas and California.

New construction, reconditioning and improvements at the Middletown Air Depot will involve expenditure of PWA funds amounting to $1,640,976.

Army Improves Combat Cars and Tanks

WASHINGTON—In the effort to attain the utmost in fast moving armored cars the Ordnance Department of the Army has under final test highly improved combat cars and tanks for use by the cavalry and infantry. They have lighter armor of improved quality and are equipped with improved machine guns which are much lighter than the 37-mm. and 6-lb. guns used in tanks during the World War. Machine guns of 30 and of 50 caliber are being used. The mechanical defects which caused so much trouble in the World War type have been overcome to a large extent. The new tracklayers are capable of attaining a speed of 35 miles per hour.

Japan Machine Industry Reported Active

A report from the the Tokyo office of the Department of Commerce cites the notable progress of Japan's machinery industry during 1933. This development resulted from a heavy demand for industrial machinery, purchases by the government for modernization of plants and large orders placed by the South Manchuria Railway Co. and the Japanese railways for rolling stock.

Although Japanese manufacturers are able to meet most of the requirements of the home market, it is still necessary to import certain types of machines, such as precision metal-working machinery and heavy internal combustion engines, which the domestic industry is not yet able to supply. While final figures for 1933 are not yet available, it is probable that the total output equaled the record output of 187,303,000 yen of 1929. Japan's total foreign trade in machinery was valued at 96,716,000 yen during 1933, an increase of 38 per cent over the preceding year. Imports rose from 58,817,928 yen to 70,859,145 yen, the highest figure since 1930, while exports showed an even greater gain, increasing from 10,943,000 yen to 25,857,000 yen as as result of heavy orders from Kwantung Province and Manchuria.

Imports of machinery from the United States were valued at 21,869,911 yen, an increase of only 27 per cent compared with 1932, while those from Germany were valued at 15,978,941 yen, a gain of 64 per cent. Imports of machinery from the United Kingdom and France declined in 1933 while those of Sweden nearly doubled.

Imports of Machinery into Japan 1932-1933

Item	1932 Yen	1933 Yen
Steam boilers and parts	1,192,482	1,790,678
Fuel economizers	50,407	124,004
Locomotives and tenders	70,397	156,112
Steam turbines	182,291	58,626
Internal combustion engines weighing not more than 250 kg	2,296,300	1,826,278
Weighing not more than 2,500 kg	9,507,483	13,954,850
Other	667,534	366,490
Water turbines & pelton wheels	9,081	.....
Cranes	4,120	58,838
Capstans & winding machines	34,069	117,338
Gas compressors	809,802	669,367
Sewing machines	3,106,274	2,060,832
Sewing machine parts	159,475	123,165
Pumps	370,186	726,229
Blowing machines	161,213	145,611
Hydraulic presses	6,945	4,876
Pneumatic tools and machines	276,507	256,029
Dynamos combined with motive machinery	47,123	112,806
Metal- or wood-working machinery weighing not more than 100 kg	146,326	228,215
Weighing not more than 5,000 kg	4,784,241	11,725,730
Metal other	877,614	4,293,134
Spinning machines	7,998,254	3,520,143
Weaving looms	106,821	12,253
Tissue finishing machines	342,382	116,347
Knitting machines	75,391	82,098
Paper-making machines	37,030	9,715
Printing machinery	291,125	20,595
Iron wheels	56,651	139,842
Rolls and rollers	206,017	241,266
Milling cutters, gear cutters and saws for machinery	203,305	266,910
Card clothing	2,031,810	2,440,890
Felts for paper-making	1,182,857	1,341,037
Metal nets for paper-making	63,687	35,828
Parts for steam turbines	89,508	284,168
Other machinery	12,463,199	11,440,659
Other parts of machinery	8,909,341	12,108,186
Total	58,817,928	70,859,145

Colonel Rorty Elected A.M.A. President

At the two-day annual conference of the American Management Association held in New York recently, Colonel M. C. Rorty was elected president for the coming year. He succeeds W. J. Graham, vice-president of the Equitable Life Assurance Society, who headed the association for three years.

Alvin E. Dodd, trade association executive, recently engaged in code planning and organization for several industries, was made executive vice-president. John G. Goetz was reelected secretary of the association. Samuel A. Lewisohn was reelected chairman of the board, and Arthur H. Young, chairman of the executive committee.

Colonel Rorty, while an electrical and mechanical engineer by training, is probably best known as an economist. He is a past president of the National Bureau of Economic Research, of the American Statistical Association and a Williamstown lecturer. He has seen over 35 years of active business service with the J. G. White Engineering Corporation, the American Telephone and Telegraph Co., the Western Union Telegraph Co., the International Telephone and Telegraph Co., and American Founders Corp.

• PATENTS •

May 29, 1934

Metal-Working Machinery

Adjustable Spring Mount and Clamp for Radial Drill Sleeves. David C. Klausmeyer, deceased, late of Cincinnati, O., assigned to the Cincinnati Bickfort Tool Co. Patent 1,960,442.

Method of Cutting Worms. Charles H. Schurr, Cleveland, O., assigned to the Lees-Bardner Co. Patent 1,960,460.

Apparatus for Generating Ends of Gear Teeth. Max Hass, Syracuse, N. Y., assigned to W. C. Lipe, Inc. Patent 1,960,536.

Work Feeding Mechanism. Ralph L. Hartwell, Agawam, Mass. Patent 1,960,538.

Feed Variator for Shapers. William F. Zimmermann, Maplewood, N. J. Patent 1,960,565.

Power Elevator for Shaping Machine Work Tables. William F. Zimmerman, Maplewood, N. J., assigned to Gould & Eberhardt. Patent 1,960,566.

Circular Table for Shapers. William G. Zimmermann, Maplewood, N. J., assigned to Gould & Eberhardt. Patent 1,960,567.

Fluid Actuated Feed Engaging Mechanism. Robert M. Galloway, Richmond, Inc., assigned to the National Automatic Tool Co. Patent 1,960,699.

Right and Left Attachment for Duplicating Machines. John C. Shaw and Robert D. Shaw, Hartford, Conn., assigned to Pratt & Whitney Co. Patent 1,960,757.

Machine for Finishing Gears. Edwin R. Fellows, Springfield, Vt., assigned to the Fellows Gear Shaper Co. Patent 1,960,841.

Machine Tool. Lyndon C. Cole, Hamilton, Ohio, assigned to General Machinery Corp. Patent 1,960,896.

Speed Coordinating Mechanism for Machine Tools. Edwin R. Smith and Albert Schinkes, Seneca Falls, N. Y., assigned to Seneca Falls Machine Co. Patent 1,961,089.

Electrically Controlled Speed Coordinating Mechanism. Edwin R. Smith and Albert Schinkes, Seneca Falls, N. Y., assigned to Seneca Falls Machine Co. Patent 1,961,090.

Self-Adjusting Steady Rest. Edwin R. Smith and Albert Schinkes, Seneca Falls, N. Y., assigned to Seneca Falls Machine Co. Patent 1,961,091.

June 5, 1934

Metal-Working Machinery

Milling Machinery. Walter D. Archea, Cincinnati, O., assigned to the Cincinnati Milling Machine Co. Patents 1,961,123—1,961,124.

Back Lash Eliminator for Machine Tool Slides. Walter D. Archea, Cincinnati, O., assigned to the Cincinnati Milling Machine Co. Patent 1,961,125.

Milling Machine. Max De Haas and Donald O. Lawless, Cincinnati, O., assigned to the Cincinnati Milling Machine Co. Patent 1,961,129.

Machine Tool. Alfred Trosch, Rochester, N. Y., assigned to Consolidated Machine Tool Corp. of America. Patent 1,961,259.

Gear Cutting Machine. Wilhelm Schmitt and Gerhard Rothe, Ettlingen, Germany. Patent 1,961,396.

Milling Machine. Lester F. Nenninger, Cincinnati, O., assigned to the Cincinnati Milling Machine Co. Patents 1,961,522, 1,961,523, 1,061,524.

Apparatus for Grooving Surfaces. Louis R. Williams, Los Angeles, Calif. Patent 1,961,540.

Electrically Driven Lathe. Bernhart A. Benson, Chicago, Ill., assigned to Chicago Electric Manufacturing Co. Patent 1,961,546.

Progressive Multiple Spindle Gear Shaping Machine. Edward W. Miller, Springfield, Vt., assigned to the Fellows Gear Shaper Co. Patent 1,961,699.

Grinding Machine. Warren F. Fraser, Westboro, Mass., assigned to Norton Co. Patent, 1,961,849.

Bearing Broaching Machine. William A. Hart, Detroit, Mich., assigned to Colonial Broach Co. Patent 1,961,928.

Tools and Attachments

Thread Rolling Die. Robert Thompson, Arlington, N. J., assigned to Dardelet Threadlock Corp. Patent 1,961,257.

Tool Holder. David E. Johnson, Rockford, Ill. Patent 1,961,442.

Universal Faceplate for Machine Tools. Joseph Piron, Brussels, Belgium. Patent 1,961,528.

Thread Gage. Soshichi Sonoda, Itabitsu, Kokura, Japan. Patent 1,961,647.

June 12, 1934

Metal-Working Machinery

Grinding Machine. William A. Goering, Chicago, Ill., assigned to the Safety Grinding Wheel & Machine Co. Patent 1,962,302.

Hobbing Machine. John B. Sinderson, Rockford, Ill., assigned to Barber-Colman Co. Patent 1,962,365.

Automatic Drilling Machine and Machine for Other Purposes. Ralph M. Lovejoy, Boston, Mass. Patent 1,962,566.

Workholding Mechanism for Machining Operations. Ralph M. Lovejoy, Boston, Mass. Patent 1,962,567.

Broaching Machine. George F. Yager, Toledo, O., assigned to the Bunting Brass and Bronze Co. Patent 1,962,674.

Tapping Machine. Martin J. Danielson and Ferdinand Lindgren, Bridgeport, Conn. Patent 1,962,894.

Machine Tool. Arthur F. Bennett, West Barrington, R. I., assigned to Associated Patents, Inc. Patent 1,962,979.

Screw Cutting Machine. Harry W. Ruppel, Shaker Heights, O., assigned to the Cleveland Automatic Machine Co. Patent 1,963,033.

Tools and Attachments

Cutter Blade Lock. Ralph R. Weddell, Shelton, Conn., assigned to the O. K. Tool Co., Inc. Patent 1,962,163.

Lathe Center. Walter W. Gairing, Kalamazoo Township, Kalamazoo Co., Mich., assigned to Nielsen, Inc. Patent 1,962,499.

Automatic Tool. William L. Libby, Cleveland, O., assigned to John G. Oliver. Patent 1,963,023.

• EXPORT • OPPORTUNITIES

Mauro Velasquez, president Club de Quimica, Apartado No. 18, Saltillo, Coah., Mexico, is interested in machinery or apparatus for production of manufactured gas.

The North China Trading Co., 49 Rue du 14 Juillet, Tientsen, China, asks information on: machinery for manufacturing electric lamp bulbs; flour mill machinery, electric motors, boilers.

Samuel Forcada, Fabrica de Sombreros "New York, Casa Mexicana, Mexico, D. F., wishes to get in touch with manufacturers of millinery machinery.

• BUSINESS ITEMS •

The Giern & Anholtt Tool Co., Inc., 1312 Mt. Elliott Ave., Detroit, Mich., succeeds the National Boring Tool Co. The company specializes in adjustable cutters, boring bars, rotating jig and pilot bushings, and fixtures for production use of tungsten-carbide boring and reaming tools.

The Jamestown Metal Equipment Company, Jamestown, N. Y., manufacturers of automobile radiators and metal products, has purchased the capital stock of the Blackstone Mfg. Co., manufacturer of washing machines.

The plant and other assets of Relay Motors Corp., Lima, Ohio, have been sold to J. G. Wray of Chicago, and E. F. Harsch of Warsaw, Ind.

The Link-Belt Company has opened a warehouse at 413-15 Second Avenue, Dallas, Texas, where stocks will be carried of Caldwell and Link-Belt conveying and power transmitting machinery. E. G. Wendell is resident manager.

Joseph T. Ryerson & Son, Inc., has completed a large plant extension at St. Louis. Approximately 40,000 sq.ft. of floor space have been added, particularly for housing products requiring special protection from atmospheric changes. Stocks are being increased and many new products and sizes will be added.

The MacLeod Company, Cincinnati, Ohio, manufacturers of abrasive blast equipment, dust arrestors, industrial oil burning equipment and paint spraying outfits, has appointed H. P. Clawson, in charge of the New York Office at 51 East 42nd St.

Jeffery-Gilles, Inc., Caxton Building, Cleveland, has been organized by Edwin W. Jeffery and Edwin J. Gilles to act as direct factory representatives in the Cleveland territory for machine tool builders. They are representing the Hendey line and the Reed-Prentice line. Both men were formerly associated with the sales department of the W. M. Pattison Supply Co., Cleveland.

• PERSONALS •

V. A. Olsen, assistant works manager of the Cadillac Motor Car Co., Detroit, has been made works manager. C. A. Raftrey has been made assistant to Mr. Olsen.

C. W. Young has been made general superintendent in charge of operations of the Buick Motor Co., Flint, Mich. Since 1926 he has been superintendent of the motor plant.

A. R. Middleton has been made assistant superintendent of the motor plant of the Buick Motor Company.

Arthur T. Brabyn has been appointed general master mechanic of the Buick Motor Car Co. Previously he had held the position of assistant general master mechanic, and now replaces Wayne H. Eddy, resigned. Mr. Brabyn's assistant will be F. C. Pyper, formerly general tool supervisor.

Edward C. Gainsborg has returned to the Roller Bearing Co. of America, Trenton, N. J., as general manager. At one time he was the sales manager.

Everett E. Gill, general production manager of the Bristol (Conn.) plant of the New Departure Manufacturing Co., has been elected a member of the board of directors.

Frederick B. Heitkamp, sales manager, Cincinnati Milling Machine & Cincinnati Grinders, Inc., has resigned to accept a position with Lyon Metal Products Inc., Aurora, Ill. He will take up his new duties on July 1.

Andrew Hommel, has been elected president and general manager of the Auburn Machine & Tool Co., Auburn, N. Y.

R. L. Rickwood has been made works manager of the Reed-Prentice Corp., Worcester, Mass. Formerly Mr. Rickwood was connected with the Worthington Pump & Machinery Co., and the Cincinnati-Bickford Tool Company.

• OBITUARIES •

Charles J. Anderson, Jr., 29, a member of the Anderson Bros. Machine Co., Jamestown, N. Y., died June 7. He was also president of the Jamestown Engineering Development Co.

Harry V. Ball, vice-president and a director of R. Hoe & Co., Boston, Mass., newspaper press manufacturer, died recently. He was first connected with the United States Shoe Machinery Co., and then joined the Hoe Company in 1906.

George T. Dewey, 75, died June 5 at Worcester. Mr. Dewey had served as president of the Baldwin Chain & Manufacturing Co., vice-president of the Graton & Knight Mfg. Co., treasurer of the Wright Wire Co.

John T. Dillon, 74, founder of the Titusville Forge Works, Titusville, Pa., and a director of the Struthers-Wells-Titusville Corp. and the Warren Axe & Tool Corp., died recently.

William T. F. Johnson, at one time president and treasurer of the Bradford Machine Tool Co., died at Cincinnati on June 12. He was 69.

W. E. Sharp, president of the Grip-Nut Co., railway supply manufacturer, died June 5, at the age of 64.

Laurel E. Wallace, 40, secretary-treasurer of the Hittle Machine & Tool Co., Indianapolis, died recently.

• MEETINGS •

American Society of Mechanical Engineers. Summer meeting, June 25. Cosmopolitan Hotel, Denver, Colo. Calvin W. Rice, secretary, 29 West 39th St., New York, N. Y.

American Society for Testing Materials. Annual meeting, June 25-29. Chalfonte-Haddon Hall, Atlantic City, N. J. A. E. Hess, assistant secretary, 260 South Broad St., Philadelphia, Pa.

Silver Bay Conference. Seventeenth annual conference on industrial relations, August 22-25. Silver Bay on Lake George, N. Y. E. C. Worman, executive secretary, 347 Madison Ave., New York, N. Y.

American Machinist

REFERENCE BOOK SHEET ©

Sizes of Standard Milling Cutters—VII

Simplified Practice Recommendation R36-34, Milling Cutters, as revised by the industry and issued by the National Bureau of Standards, effective April 15, 1934.

Sprocket Wheel Cutters for Roller Chains

[American National Standard Tooth Form. Carbon and high-speed steel.]

Circular Pitch	Diameter of Roll	No. of Teeth in Sprocket	Diameter of Cutter	Width of Cutter	Size of Hole
		6	2 3/4	11/32	
		7–8	2 3/4	11/32	
3/8	0.200	9–11	2 3/4	11/32	1
		12–17	2 3/4	11/32	
		18–34	2 3/4	11/32	
		35 & over	2 3/4	11/32	
		6	3	3/4	
		7–8	3	3/4	
1/2 to 5/8	0.313	9–11	3 1/8	3/4	1
		12–17	3 1/8	3/4	
		18–34	3 1/8	23/32	
		35 & over	3 1/8	11/16	
		6	3 1/8	3/4	
		7–8	3 1/8	3/4	
5/8	0.400	9–11	3 1/4	3/4	1
		12–17	3 1/4	3/4	
		18–34	3 1/4	23/32	
		35 & over	3 1/4	11/16	
		6	3 1/4	23/32	
		7–8	3 1/4	23/32	
3/4	0.469	9–11	3 3/8	23/32	1
		12–17	3 3/8	7/8	
		18–34	3 3/8	27/32	
		35 & over	3 3/8	11/16	
		6	3 3/4	1 1/4	
		7–8	3 7/8	1 1/4	
1	0.563	9–11	3 7/8	1 3/16	1 1/4
		12–17	4	1 3/32	
		18–34	4	1 3/8	
		35 & over	4	1 3/32	
		6	3 7/8	1 1/2	
		7–8	4	1 1/2	
1 to 1 1/4	0.625	9–11	4 1/8	1 1/2	1 1/4
		12–17	4 1/8	1 1/2	
		18–34	4 1/4	1 1/2	
		35 & over	4 1/4	1 1/2	
		6	4 1/4	1 1/2	
		7–8	4 1/4	1 1/2	
1 1/4 to 1 1/2	0.750	9–11	4 1/2	1 1/2	1 1/4
		12–17	4 1/2	1 3/4	
		18–34	4 5/8	1 1/2	
		35 & over	4 5/8	1 5/8	
		6	4 3/8	1 1/2	
		7–8	4 1/2	1 1/2	
1 1/2	0.875	9–11	4 5/8	1 1/2	1 1/4
		12–17	4 5/8	1 3/4	
		18–34	4 3/4	1 1/2	
		35 & over	4 3/4	1 5/8	
		6	5	2 3/32	
		7–8	5 1/8	2 3/32	
1 3/4	1.000	9–11	5 1/4	2 3/16	1 1/2
		12–17	5 3/8	2 3/32	
		18–34	5 1/2	1 1/2	
		35 & over	5 1/2	1 7/8	
		6	5 3/8	2 1/2	
		7–8	5 1/2	2 1/2	
2	1.125	9–11	5 5/8	2 5/8	1 1/2
		12–17	5 3/4	2 5/16	
		18–34	5 7/8	2 1/4	
		35 & over	5 7/8	2 3/32	
		6	6 3/8	3	
		7–8	6 5/8	3	
2 1/2	1.5625	9–11	6 3/4	2 11/16	1 3/4
		12–17	6 7/8	2 11/16	
		18–34	7	2 3/4	
		35 & over	7 1/8	2 11/16	
		6	7 1/2	3 11/16	
		7–8	7 3/4	3 11/16	
3	1.900	9–11	7 7/8	3 11/16	2
		12–17	8	3 11/16	
		18–34	8	3 11/16	
		35 & over	8 1/4	3 7/32	

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*Heading, page 349, should read "Staggered Tooth Side Milling Cutters."

Making Wood Hogs Do Their Job

H. M. PLAISTED

FORMERLY, practically all the sawdust, slabs, and ends of dimension lumber from saw mills were sent to the "burners." These were plate iron cylinders 50 to 100 ft. diameter and height, with a screen top. Now, wood pulp, laths, and fuel for factories utilize a goodly percentage of this waste. Slabs fed to boilers make uneven steam pressure by their tendency to pack and check the draft, but when cut up into small pieces by "wood hogs," efficient combustion is obtained.

There are three kinds of this "hogged fuel" made by different machines: flat chips, rhomboidal, and splintered. The first two varieties are made by machines having knives set in spools or cylinders. These knives are easily damaged by tramp metal occurring in the feed. The third variety is made by machines having rotary hammers, the pointed ends of which suffer little damage from such tramp metal, and produce a splintered fuel that burns better in the furnace. It also allows 20 per cent of sawdust to be mixed with it without materially affecting its efficient combustion.

Knives for Wood Hogs

The cutting blade of a jack plane makes an angle of 45 deg., and a rotary saw 60 deg. The style of "hogs" using knives are based on the cutting principle. In making splintered fuel, however, a different principle is followed. The angle may be as much as 90 deg. though a lesser angle reduces the strain on the machine. Certain points are necessary for efficient operation. These are based on the practical experience of the writer and would have saved thousands of dollars in expensive experiments to one maker of crusher using rotary hammers. He had used a breaker plate inclined 40 deg. to the horizontal in his stone crushers with fair success, and he found that waste wood could be reduced to splinters for hogged fuel by his crusher.

But an error was made in using the low slanting breaker plate, on which the splintered wood piled up and refused to pass through the hog and out through the bar cage. This was especially evident in reducing veneer waste and laths which cannot be satisfactorily reduced on knife hogs, as they were simply gouged out in spots, and the long pieces frequently clogged the pipes of the compressed air charger that sent the fuel to the hog house. Raising the breaker plate of the hammer crusher to 70 deg. to the horizontal, Figs. 1 and 3, this lodgment on the breaker plate was overcome. Even spruce laths, which are like rope, were reduced successfully.

Too Much Clearance

Another error was the use of a preliminary breaker plate above the anvil edge of the main breaker plate. This lower anvil edge had one-half inch clearance and was located substantially in the horizontal plane through the rotary shaft in hogs of 30 in. hammer circle diameter, as in Fig. 3, and below said plane in hogs of 48-in. hammer circle (Fig. 1). This other plate had been useful in preliminary breaking of bark and had 2 in. clearance. When this was used, however, it was found that slabs would hang up, and other pieces pile up behind them to choke quickly the feed. Also this other plate increased the angle on which the hammers engaged the slabs and dimension timber ends, sometimes resulting in fracture of the hammers or the hammer rods on which they were pivoted.

Knife hogs run at 900 r.p.m. Hammer hogs of 30 in. hammer circle, direct connected through a flexible coupling with a 75-hp. motor, run at 1,160 r.p.m. A larger hog of 48 in. hammer circle was run at 880 r.p.m.

The peripheral speed of the 30-in. machine was 150 ft. per second, and with six hammers gave 116 blows per second. In the 48-in. machine the peripheral speed was 184 ft. per second and gave 88 blows per second. This took slabs having a butt end 6 in. thick and 30 in. wide with apparent ease. Timber ends of 8 and 10 in. made more strain on the machine, on account of the greater angle of impact, and of the point of impact being at a greater distance from the anvil edge.

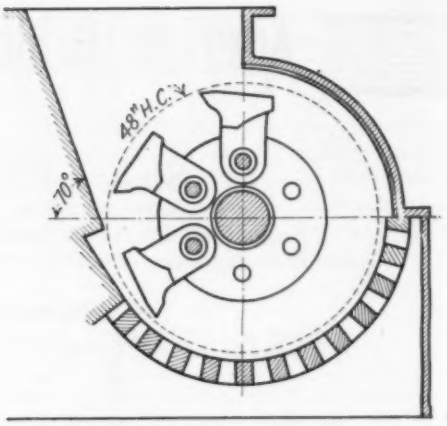


Fig. 1—How lodging of pieces was overcome by raising the breaker plate

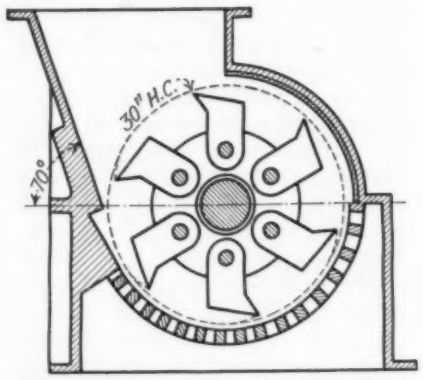


Fig. 3—This shows a smaller breaker but the same treatment helped here also

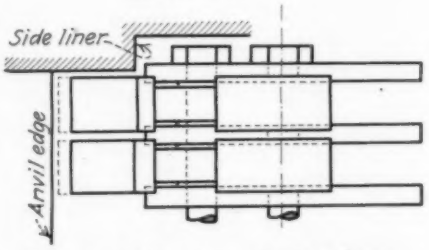


Fig. 2—Plan view of the large breaker showing how side liner fills the gap

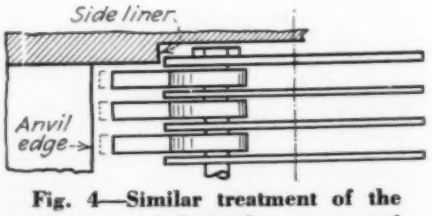


Fig. 4—Similar treatment of the other wood hog that prevented clogging

Most of the splintering is done at the anvil edge, and the bar cage openings should be 1¼ in. at the front up to 2 in. at the back, for the 30-in. machine. For the 48-in. machine the openings should be 2 and 2½ in.

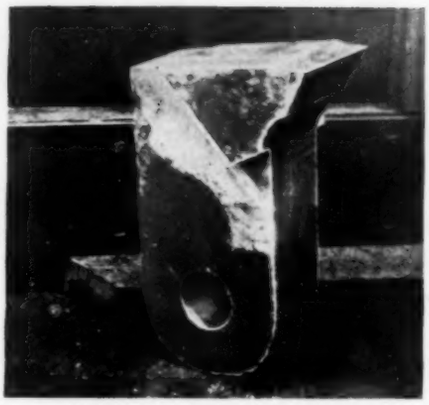


Fig. 5—Forged chrome-nickel hammer that does the work. It weighs 135 lbs.

Long edgings and laths, entering endwise, seek the clearance space between the end hammers and the side liners, and often cause the feed to pile up behind them. These side liners should fill the end space except for a ⅜-in. space at the sides of the end hammers (Figs. 2 and 4). No projecting bolt heads or edges of liners should be allowed, as they frequently cause the feed to hang up. These details may seem insignificant, but experience has shown that they are important.

The chute from the conveyor to the hog should be 7 ft. or more higher than the machine, especially when reducing veneer waste and light feed. With a pit allowing a 7-ft. drop, the feed enters the hog without difficulty. The chute should have sides flaring outward and downward so as to be wider at the bottom than at the top.

The best shape of hammers for hogging wood is the pointed, hawk bill style. These are made in various sizes, thickness and weights. For 30-in. machines, forged steel up to 1½ in. thickness and 8¼ in. center to point are used. The 48-in. machines take manganese hammers of 14 in. center to point, 2x8-in. shank, 3½ in. wide at the point, and weigh 75 lb. Heavier hammers, 4x8-in. shank and 5½ in. wide at point, weigh 140 lb. and are preferable on large sawmill slabs and dimension ends.

Fig. 5 shows a forged chrome-nickel hammer weighing 135 lb. made by the Isaacson Iron Co., Seattle, Wash.

Is Your Shop Spoiling Too Much Work?

P. H. BRYANT

"My great mistake," remarked a prominent tool engineer whom no one would have suspected of making mistakes, "was that I allowed my eyes to be blinded by our own spot-lights."

For years, he went on to say, he had kidded himself and his superiors into the belief that their plant worked to closer tolerances and turned out a more uniformly hardened product than any of their contemporaries and that it followed naturally that they must be good. Some three years ago, the thought came to him, from a source that he cannot now recall, that possibly he and his associates were centering attention too much on home-made estimates of probable performance and not enough on what was actually being accomplished.

Having a cumulative three months' vacation due him, he decided, without disclosing his purpose to anyone in the organization, to take that time to check up on reactions to their product to be gathered from friendly and seemingly purposeless calls on shops in those sections where their sales were heaviest.

"I started out," he continued, "anticipating the confirmation of our sincere belief in the superiority of our product. I returned convinced that, without regard to whether the goods we sold were better or worse than those of competitors, from the standpoint of users requirements, they were rotten."

He reported to his superiors what he had done and the conclusions reached, "Give the shop hell," was their instantaneous reaction. But ultimately he convinced them that the shop was the least of all of the contributing factors to be held to blame for the unsatisfactory conditions.

The plan he finally persuaded them to authorize went much further back than the shop. It went back to the tools that made the tools that the shop used.

"Did you ever keep a record," he asked, "of the number of purchased special tools that were received at your plant, put into production, found wanting in one or more particulars and returned to the maker, only to find later on your desk a polite disclaimer of responsibility from that maker in some such stock phrases as 'our inspection department has carefully checked the tools returned to us and can find nothing wrong with them?' We never did, but I wish we had—it would certainly constitute an illuminating record."

His new plan, based on the experiences and subsequent analysis of that summer's vacation, sought to change all that. Its central thought was an emphasis of performance as embracing all departments rather than allowing so-called technical departments to specialize in the pure mathematics and technique of tool making and to pass all responsibility for performance on to the shop. From executives down, the theme song of that plant became, "Its not what it ought to do, but what it does that counts," and in the slightly more than two years that it has been getting under way, it has accomplished wonders both in smoothing out internal organization wrinkles and in decreasing the percentage of defective product that gets into the hands of users.

Here are some of its practical angles.

Wherever conditions make it possible, in setting up tool-making specifications, either for their own shop or for outside purchase, the method deals not so much in details of the tool itself, as of the work it is to do. For example, if it was for a form tool to turn or mill a certain contour, there would be given

1. An outline sketch of the tool giving such dimensions as were necessary to make it adaptable to plant equipment and specific conditions.
2. A detail of the work form to be reproduced by the tool, with allowed tolerances specified for all dimensions.
3. A notification to the maker on the specification print that he must furnish with the tool a sample of the work it will produce, and a certified copy of his own measurements of that sample that showed it to be within the tolerances specified.

For the purposes of this method, the plant's own tool department was treated as just another source of supply and held to the same formula. Upon the receipt of new tools from any source, the tools themselves are checked only in those features that are essential to make them usable in that plant. For instance, on a certain type of form milling cutter the specified top rake is uniformly five

degrees and a tool-grinding fixture is used for sharpening the cutters having a permanent set at that angle.

A maker might discover that the tool when finished would not produce the specified form with a 5-deg. rake but would duplicate it if the rake angle was altered somewhat. He would be tempted and might yield to the urge to make the change in angle, but there would be no alternative but to reject his product because the first time it went to the plant's own toolroom for a regrind, its form would be ruined.

In another instance, a maker, thinking to give his customer a better mill than he had specified, produced wellnigh perfect samples but sent in spiral instead of straight fluted cutters. The plant had only permanently set facilities for straight-flute grinding and the maker's good intentions went for naught.

This sort of thing has to be guarded against on the tool, but in a broad way the plant, under this system, is concerned only with the correctness of the sample. The sample is checked by a method devised by the plant engineer and the form as measured is plotted on a stock form (8½ by 11 in.)

It may or may not check with the maker's certified dimensions or be adjudged within the prescribed limits of accuracy, but in any case it does not go into the shop until it is known that it will do for the shop what is required by their production orders. Then if specifications are not met in the plant product, it is known for a certainty where the fault lies.

The system is not confined to new tools, but has been adopted to cover the regrinding of used tools. Under this method, a tool taken out of the shop for any purpose is never returned until certified again for correctness of specification. Means have been provided for producing samples from the reground tools. These samples are not normally subjected to such exhaustive measurements as marks the original check-up but rely on probability for much of the detail.

For example, a thread generating hob would be tested, when first received, for correctness of thread depth, flank angle, pitch, etc., on every separate tooth in the hob. After sharpening, the sample cut might, if the cutter showed no visual signs of deterioration, be checked for each half inch or so along its length for thread depth only, the probability being 100 to 1 that if the depth was still inside the tolerances, no other characteristic could have changed sufficiently, to carry it outside.

"Undoubtedly your first reaction to a system involving so much detail," the engineer concluded, "is that it is too expensive to justify itself. Certainly it is expensive, but in view of what it has accomplished for us, it is my honest belief that its cost is not a tenth of the loss, apparent and invisible, that was rightly chargeable to the method it is still in the process of displacing.

"Under the old method, such records as were kept would certify the tool as correct, but the product record proved it wrong, and there was no link involving a common responsibility between the two. Under the present plan, we know before we start, and file a record of the data on which that knowledge is based, that the tools will produce the materials as specified. You would be surprised to what degree our complaints and reactions have been reduced."

Is your shop spoiling too much work and being shouldered with the blame? Study this problem in its broad aspects and see if it may not be possible that you, like certain ancients, are forcing men to make bricks without straw.

Soviet Side Lights

A. M. WASBAUER

Truth is stranger than fiction, it is said. I never believed it before, but after verifying the first story which follows, and reading the second in Pravda, I must perforce be convinced. I will go a step further and say that no amount of statistical figures could convey a better idea of the inefficiency and bureaucratism prevalent in some Russian enterprises.

Be it known that every large state-owned plant has its fire prevention and fighting system. One such plant in the North equipped with a modern fire alarm system was visited by a controller from the regional Soviet. After showing his pass and passing the gate guards his first act after entering the grounds was to break the glass in one of the fire alarm boxes and give a false alarm. As this brought no results, he telephoned fire headquarters, and announced that a fire was raging in Shop 7. This is what he got:

Fire Headquarters: "Who are you?"
Controller: "I am a worker in this shop."
F. H.: "Are you the boss?"
Controller: "No, only a worker."
F. H.: "Well, then, mind your own G. . . .m business."

The fuming controller marched towards fire headquarters and on the way met a fireman. Said the fireman: "I say, I hear there is a fire in Shop 7, do you know where that is?"
Controller: "You so and so and so and so and so!!!"
Fireman: "Well, don't get hot, we have no water anyway."

You have probably heard that there was recently a general transfer of all the heavy personnel of the Secretariat of Agriculture. The following account of bureaucratism recently appeared in Pravda in much greater detail. I am giving you a true but condensed version:

"A man was sent from Moscow to Odessa to direct a large state farm which had not been giving results. He arrived at his post Jan. 24, 1933. The next day he received a nasty telegram from the First Secretary of Agriculture for non-fulfillment of plan. He thought it was an error, but two weeks later he received a similar telegram from another under-secretary for the same cause.

"Just as he had decided to quit his post rather than be fired, and perhaps brought to trial on charges, he received a premium of several thousand roubles from another under-secretary for over-fulfillment of plan. Almost at once, he received a terse telegraphic order from another source instantly relieving him of his duties, but before he had time to clear out, there came a cancellation of his dismissal accompanied by an apology.

"By this time, of course, the man was frantic, but to recount in detail all the censures and all the premiums he received in one short year would occupy too much space in this letter. Suffice it to say that during that year, that farm director received seven terse telegrams of censure and nine money premiums, from various secretaries and under-secretaries of various republics for alleged under-fulfillment and over-fulfillment of plan in various agricultural products. Also, during that time, he was unconditionally fired twice and reinstated with apologies."

This proves him to have been a man of cast iron nerve, and if he was not crazy by that time, it is my private opinion that he should be able to endure a few months of recuperation in one of the Crimean or Caucasian Rest Homes.

Deep Hole Drilling

Deep hole, or gun drilling, as it is sometimes called, has always been a real problem. Special single-lipped drills mounted at the end of a steel tube were developed and are largely used. High oil pressures, from 300 to 1,000 lbs., are used to wash out the chips. New twist drills with larger flutes and a somewhat slower helix, plus specially ground cutting edges, are now being used quite successfully for moderately deep holes and without forced lubrication. The coolant used also has its effect on good drilling as on other operations.

THE ROUND TABLE

Propaganda Plates

"Almost every time I open a newspaper or one of these magazines dealing with half-baked economies, I see a cartoon or an article showing the terrors of the Machine Age," said Ed, as he joined Al for lunch. "You know the kind—a mechanical robot with his sheet-iron foot on the neck of a sniveling grub of a man, or a lurid blast on how we are all going to be ground to pulp in the gears of a super-automatic."

Al nodded. "Yes, we've all seen them. It's a pet topic whenever there's any considerable unemployment. Machine baiting goes back to the time the first one was invented—but we can't do without them."

"Well, it's high time that those of us who make a living in the machine industry did something about it—something to offset the plausible fallacies that are getting so much attention. If we don't, a lot of people will really believe all this tripe and do something to stop the buying of machinery. In the long run that will hurt all of us."

"Yes, even the hacks who make a living writing about the Machine Age. But, seriously, I think the best course is to let our pseudo economists blow off steam. Don't you?"

"No, Al; we should keep the man who runs the machine sold on its value. He's the one who is affected most and if he's satisfied no one else should complain."

"Except, perhaps the man who used to operate a machine. But what is your solution?'

"I suggested it to Williams last week. My plan is to put a brass plate on every machine we ship where it will be seen by the man who runs it. The plate will say that the machine will improve his product, keep prices down and thus increase sales in the plant where it's used. This in turn will make more jobs. In addition, the plate will point out that building the machine created employment in our own plant. So instead of putting men out of work the installation of the machine will reduce unemployment. What do you think of the idea?"

"Offhand, Ed, I'd say that it's not so hot. Workmen get more propaganda than they can digest now, and you want to add to it. Reading your plate would give most operators an acute pain. The best defense against these anti-machine blasts is a man's own common sense."

"But, Al, don't you think we should do something to check these wild-eyed theorists who'd have us go back to handicraft?"

"Not that way, Ed. The way to fight phoney doctrines is with truth—not propaganda plates. You're just trying to substitute one false idea for another, and any intelligent man will resent it."

"I don't get you, Al; my plates will tell the truth."

"Yes, but they're intended to give the wrong impression. We build machines only because they mean a net saving in human effort. Otherwise the user could not afford to buy them. The real problem is to make it possible for all classes to enjoy the fruits of the machine; that is, to make mechanical improvement work for all of us."

"But what about these fellows who would put a halt on new inventions and machines?"

"They've been trying to do that for a hundred and fifty years, Ed. But the demand for improvement is too strong to be stemmed."

Is Ed's plan for the economic education of the workman sound or will it produce a negative reaction? Should any other steps be taken to offset prejudice against the use of mechanical equipment?

Discussion

Subsidized Suggestions

Suggestions from men in the shop are as old as industry itself. Do not workmen make suggestions to the foreman and does not he pass them up the line to those higher in authority? While many suggestions are impracticable, there are possibilities of great good in the system.

I know of a wage earner in a certain steel mill who suggested a change of process that saved the concern $15,000 a year. He was promoted to a much better position and received a nice cash reward.

The man who feels so big that he cannot receive suggestions from those under him is alone in the world. Accepted suggestions should be paid for according to their merits. The executive who accepts and pays for good suggestions is not only helping himself, his workers and the management, but is instilling team work, good fellowship and cooperation in the minds of his men.

—R. C. Flohr.

It seems to me that stimulating suggestions from employees is just as important as engaging the services of outside experts on advertising, tooling or merchandising. Certainly the man on

the job would be expected to have better thoughts about that particular job than would someone far removed therefrom.

Many concerns make the mistake of expecting suggestions without paying for them, and the employees naturally resent it. Suggestions from employees should have a code of identification to eliminate the personal element, and a reliable committee should be appointed to act upon them. Accepted suggestions that effect large savings should pay dividends to the workers responsible for them, either in promotion or in cash, or in both. Properly handled, the suggestion idea has great possibilities, but most failures of the system have been due to shop politics, weak-kneed management or lack of rewards.

—J. MURPHY,
Murphy Tool Company.

Stimulation of suggestions is worthwhile; in fact practicable suggestions are the life blood of any organization. When the management has such a narrow-gage, single-track mind that it does not believe that others have worthwhile ideas, we can expect suppression of workers' suggestions. Worst of all and most contemptible is the executive who kills a worker's suggestion, leaves it buried for a time and then resurrects it and claims it for his own. When workers or minor executives have to fight to put across constructive ideas that benefit the management only, ideas will have a hard time being born and will gradually cease to be offered.

Instead of letting it be made uncomfortable for the suggesters of ideas, substantial cash and promotion awards should be given for well worked out, practicable ideas. The man frequently offering such ideas should be marked for promotion and be pushed ahead as fast as he can stand it. —E. E. GAGNON.

I certainly would never discourage suggestions. I wouldn't want to hold contests because of the triviality of the suggestions which I would get. On the other hand, I would never want my men to think that suggestions weren't welcome, because they are always.

Men are pretty close to their jobs, as a general rule, and often they have much more to say than they own up to. It's another case where I have everything in the world to gain and absolutely nothing to lose but a bit of time.

If anyone has a suggestion, I'm always glad to hear it—I'm never too busy. If the suggestion is worth anything, well and good. If not, that man finds why not, and he becomes a better and bigger man for the knowing.

—MORRY TANENBAUM.

NRA and the Small Shop

With NRA as his guiding light, the small manufacturer has been placed in a unique position in regard to competition. It is imperative that each enterprise sell its output at a profit, to end cutthroat competition. It is true that prices in general are being raised and possibly they have not reached their zenith. In former years, sales appeal was based on the idea that if a thing were cheap it would find a ready market. From now on all standard outputs will be sold, not on a price, but on quality and superiority of design.

There is a golden opportunity for the

small enterprise to develop and encourage practical improvements suitably protected by broad patent claims. With such weapons intelligently applied, the sales resistance will be leveled, opening avenues for productive sales efforts. Under the stimulating effects of NRA we will witness in the next decade an avalanche of inventions and discoveries that will make the past dwindle into obscurity.

Personally, I feel that we are on the stepping stone of an era of prosperity that will overshadow that prosperous year of 1929 that we have so proudly used as a comparative yardstick in the years of depression. Let us profit by the mistakes of the past.

—HAROLD L. WYNN,
Executive Engineer,
Pacific Electric Mfg. Corporation.

Within Reason?

To have men who will do as they are told, no matter what the task may be, is of decided advantage to the employer, for he is then in command of the situation. Just as clearly it is to the advantage of the employee to know exactly where he stands. He likes to know what he is hired to do.

Should the employer occasionally ask an employee to do something else than his regular work, or to help out in another department, the employee should do so. If the work is not particularly below the class and standard of his regular work, he has no legitimate reason for refusing.

But if the employer should make a habit of taking a workman outside of his regular department to do other work, then the workman is in a position to complain. If the new work is heavier than his regular work, the workman should receive extra pay while doing it. However, if the new work is less laborious than his regular work, he should do it willingly. By using a "within reason" policy, most arguments can be avoided. —WILL HERMAN,
Superintendent, Tanenbaum & Son Oil Company.

Any reasonable foreman should know the limits of his men's duties without recourse to hard and fast rules. It is generally understood that a man should do any work that is in any way related to his job, and that in an emergency he should help out on other work.

A workman should be willing to clean his own bench or machine, but he should not be asked to clean up another's dirt. He should be willing to make repairs or adjustments to machines in any part of the plant. No job that requires his particular degree of skill should be beneath him. But the foreman should respect the men's rights and not impose too many disagreeable jobs on them. A fair-minded management will recognize the loyalty of a workman who cooperates by performing any reasonable job in a satisfactory manner.

The whole question is best summed up in a motto that used to hang in the office of a certain shop. It said, "The man who never does more than he is paid for is never paid for anything more than he does."

—HEBRERT M. DARLING.

It has always been my personal conviction that the taking of wages from an employer was a tacit acceptance of the fact that the interests of both employer and employee were identical. That being so, it entails a certain willingness on the part of the employee to further such mutual interests by occupying the hours of labor as profitably as possible, no matter how menial the alloted task seems to be. From my observation and experience, it would seem that nine out of ten shopmen share this conviction.

Al would seem to have encountered one of the troublesome tenth; a shop-lawyer type who is a stickler for observing shop rules that are written expressly for his benefit, without regard for the welfare of the employer who framed the rules.

In the final analysis, the limitations of an occupation are determined only by the energy, ability and willingness of the workman. The wise employer is he who recognizes this and by careful planning utilizes each productive minute to its fullest advantage.

—ROBERT S. ALEXANDER.

• IDEAS •
FROM PRACTICAL MEN

Four Types of Counterbores

C. W. PUTNAM

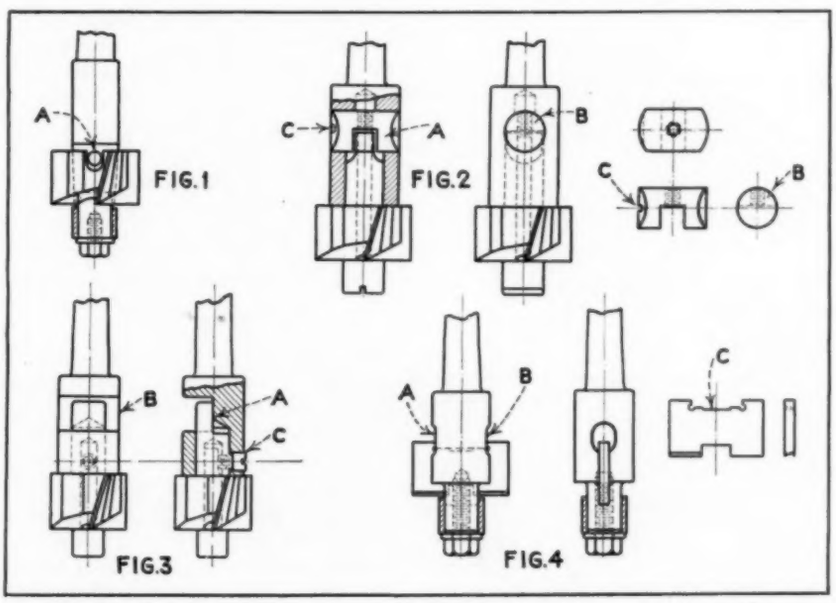
In the counterbore illustrated in Fig. 1, the lower end of the arbor has a taper seat for the cutter. The driving pin *A* is a tight fit in the arbor and engages the driving slot on each side of the cutter. The pilot is an integral part of the arbor and is small enough to permit bushings to be slipped on it to fit holes of various sizes, the bushings being held in place by the screw shown.

An assembly of a counterbore in which the arbor is drilled and reamed for the shank of the cutter and for the driving pin is shown in Fig. 2. The cutter shank has a tongue on the end to fit the slot in the driving pin and is drilled and reamed for the long shank of the pilot. A line is scribed on the arbor and on the end of the driving pin *A*, as at *B*. Bringing the line on the pin into coincidence with the line on the arbor brings the tapped hole in the pin in line with the threaded end of the pilot shank, so that the shank can be screwed into the pin. The lines are brought into coincidence by turning the pin with a screwdriver engaged in the slot *C*.

In the counterbore illustrated in Fig. 3, the lower end of the arbor is drilled and reamed for the shank of the cutter, which is slabbed at *A* to engage the side of the slot *B* for driving. The pilot is held in by the screw *C*, holes for which are drilled in both the arbor and the shank of the cutter. The hole in the cutter shank is tapped, while the hole in the arbor is for clearance for the head of the screw. The screw also holds the cutter in place.

The arbor of the counterbore illustrated in Fig. 4 is slotted to receive and drive the flat cutter, and is slabbed at *A* and *B* for locating the cutter by its slot *C*, the sides of which are ground to fit the flats slabbed on the sides of the arbor. The pilot is an integral part of the arbor and is small enough to permit bushings to be slipped over it to fit holes of various diameters. Both the bushings and the cutter are held in place by the screw shown.

All the cutters are high-speed steel, and all except the flat one have four teeth.



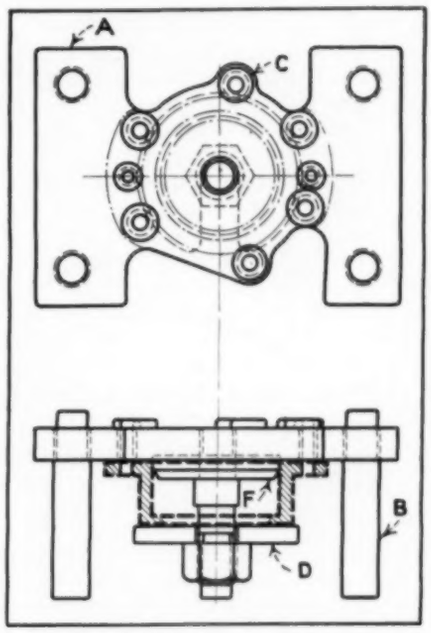
All of these counterbores are efficient tools. In some, the pilots are integral parts of the arbors, while in others they are removable and are held in place by different methods

A Profile Drill Jig

D. L. BROWN

Bearing retainers and similar parts are often scrapped in production on account of the holes being drilled off center with the bolt lugs. Much of this kind of work is located in jigs by V-blocks and is sometimes forced off center on account of some small, unimportant defect. Furthermore, if the initial operations of boring and turning are slightly off center, and the work is located in the drill jig by a sliding V-block engaging one of the lugs, that lug will be drilled correctly, but the holes in lugs on the opposite side will be drilled off center, magnifying the error.

To eliminate unnecessary scrap from the causes mentioned, the profile type of jig illustrated has proved to be entirely satisfactory. The jig base *A* is supported by the four legs *B*, as is also the plate that holds the bushings *C*. The work, indicated by heavy dotted lines, is clamped in the jig by means of a stud, a nut and the C-washer *D*, being centralized by the locating plate *F*. The bushing plate has the same profile as that of the work and the operator can see at a glance whether or not the work is correctly located, or whether or not the initial operations of boring and turning have been correctly performed. Extensions of the legs above the bushing plate support the jig when it is turned bottom side up for loading and unloading.



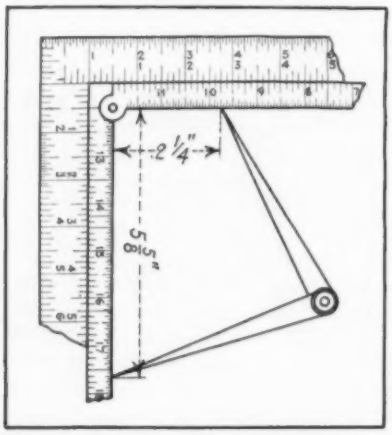
The bushing plate of this jig is of the same profile as that of the work and the operator can see whether or not the work is correctly located

Scribing Circles at Planes Differing from the Centers Discussion

CHARLES KUGLER

Referring to the article under the title given above by C. W. Putnam (*AM*—Vol. 78, page 23), the same results can be obtained with ordinary tools as with the device described. The problem is, of course, to find the hypotenuse of right-angle triangle when the other two sides are known, this can easily be calculated, and it should be calculated if extreme accuracy is required.

The illustration shows how I used a carpenter's square and a two-foot rule



When a circle is to be scribed on a plane lower than that of the center for the dividers, the correct radius can be found by this method

for solving this problem on ordinary work for many years. The rule is opened and is placed on the inner angle of the square. By placing one leg of the dividers on the division corresponding to the radius of the circle to be scribed, and the other leg on the division corresponding to the height of the center, the dividers will be opened the correct amount.

If the graduations on the square are close enough, the measurement can be taken from the square and the rule need not be used.

MATTHEW HARRIS

Mr. Putnam has made a rather expensive tool for solving a very simple problem. Besides, his results are apt to be approximate only, because it would be difficult to hold one divider point exactly coinciding with one of the graduations on the vertical scale.

The dimension to which the dividers must be set to scribe a circle 11¼ in. in diameter from a plane 2¼ in. above that on which the circle is to be scribed can easily be found as follows:

$$\frac{\text{Height}}{\text{Radius}} = \frac{2.25}{5.625} = 0.400 = \tan 21 \text{ deg. } 30 \text{ min.}$$

Sec 21 deg. 30 min. × radius = 1.0748 × 5.625 = 6.046 = distance between divider points to scribe the circle. Probably 6.05 in. would be close enough for Mr. Putnam's purpose, and it could easily be read on a scale graduated in hundredths of an inch. However, if Mr. Putnam is fussy and wants a more exact dimension, the measurement can be transferred from points to be found on nearly all vernier calipers. The dimension can also be found by the well-known arithmetical rule, in which the hypotenuse of a right angle triangle is equal to the square root of the sum of the squares of the other two sides.

Holding Facing Cutters Against Their Cutting Faces

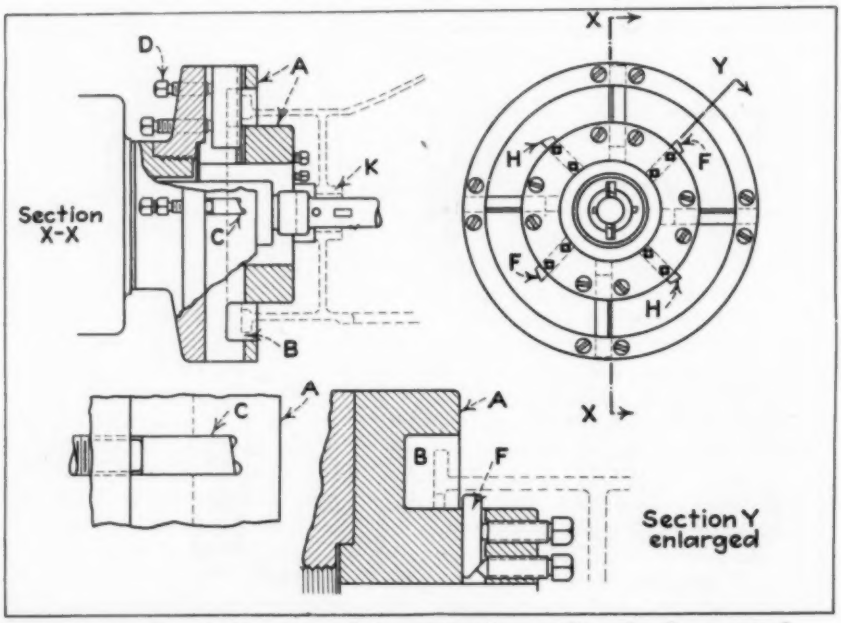
ALFRED M. WASBAUER

The method of holding facing cutters against their cutting faces, as shown in the illustration, has many advantages over the usual method of adjusting each cutter independently by its backing screws.

In the cutter head illustrated, the cutter holder *A* is attached to the faceplate of a horizontal boring machine. It is a steel ring having a central groove at *B* to clear the work, and the four radial slots *C* to admit the cutters. The bottoms of the slots are relieved in the corners and are at an angle corresponding to the front rake of the cutters, as indicated in the enlarged partial view in the lower left-hand corner. The cutters straddle the circular groove in contacting the work and are held against their cutting faces by the screws *D*. Thus, if all the slots are of the same depth, the cutters must obviously be set to take a cut of even depth, regardless of the amount ground off of them in sharpening.

The shape of the cutter holder will, of course, vary with the work to be done. In this instance, the frontal portion of the holder is extended to carry tools *F* and *H* for rough and finish boring the inside diameter of the flange before the facing cutters are brought into action. Also, the boring bar of the machine is used simultaneously with the facing cutters to bore and face the central hub *K*, the table feed being used for boring and facing the flange, and the bar feed for boring and facing the hub.

Among the advantages of holding the cutters against their cutting faces are: The cutters do not have to be ground and stacked in pairs, the only requirement in grinding being to produce straight cutting edges; the faces at the backs and edges do not have to be parallel; the cutters are supported more rigidly than is otherwise possible; there is no resetting of cutters or machine after replacement; when the cutters are clamped in place they are set, and once the machine is set for depth of cut it remains permanently set, regardless of cutter replacement; fewer clamping screws are required; and there is no tendency for the cutters to shift in clamping.



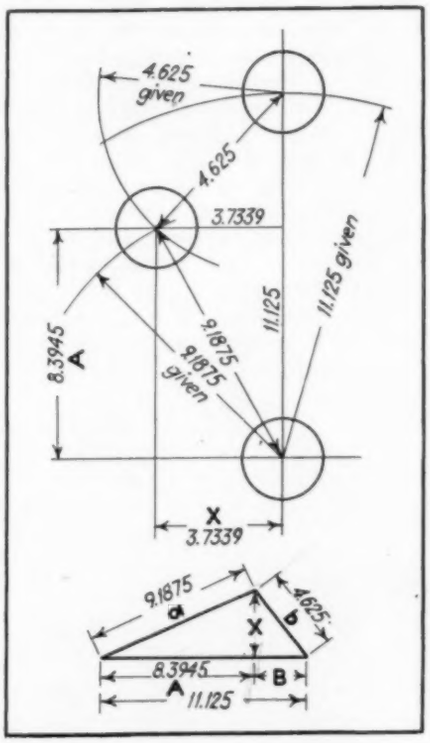
Facing cutters held against their cutting faces will each take a cut of the same depth, regardless of how much metal is removed in sharpening, or how often they are reset

A Problem in Laying Out

HAROLD E. MURPHEY

In the sketch is shown a problem that is often met with in jig work, the center distances between the holes only being given. In laying out or boring the holes, the toolmaker would want the dimensions *A* and *X*. With these dimensions known the job would be a simple one.

Lines drawn through the centers of



the holes form an unequal triangle, with the length of the sides given. As this problem would be solved by algebra by one versed in that science, I am submitting a solution in simple arithmetic. It will readily be seen that the solution is just a case of proportion and square root.

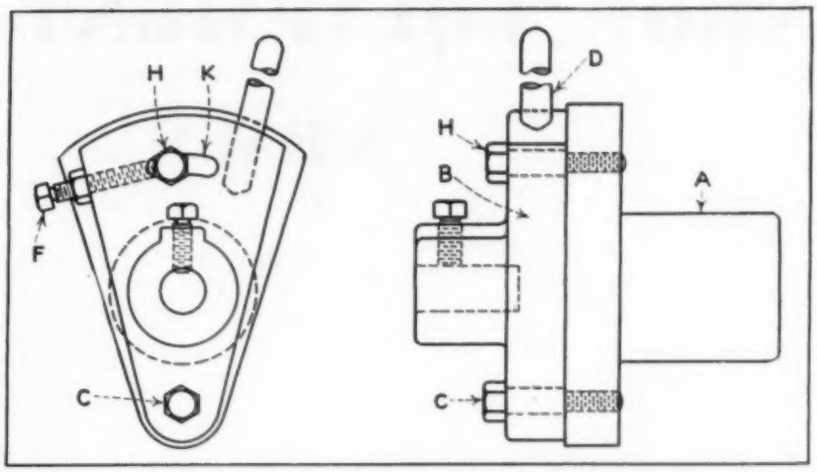
A Recessing Tool for the Turret Lathe

DON R. HAMMITT

Chief Engineer, Portland Forge and Foundry Company

Many jobs in the turret lathe call for a recess in the bore of the work as clearance for tapping or grinding. Having a large quantity of work in which the holes required to be recessed and having no tool for the job, we designed the device illustrated for use in the turlet lathe.

Essentially, the device consists of the body *A*, having a shank to fit the holes in the turret, the outer end being in the



By means of this simple device in the turret lathe, holes in the work can be recessed to give clearance for tapping or grinding

form of a sector; the mating sector *B*, pivoted at *C* and having provision for holding the recessing tool; and the lever *D*, for swinging the sector *B* on its pivot.

In operation, the sector *B* is pushed back to permit the tool to enter the hole in the work. After the tool has been positioned for the recess, sector is brought forward by the lever, bringing the recessing tool into contact with the work and cutting the recess. The depth of the recess is controlled by the stop screw *F* contacting with the stop *H*, the slot *K* preventing the stop from interfering with the necessary movement of the sector.

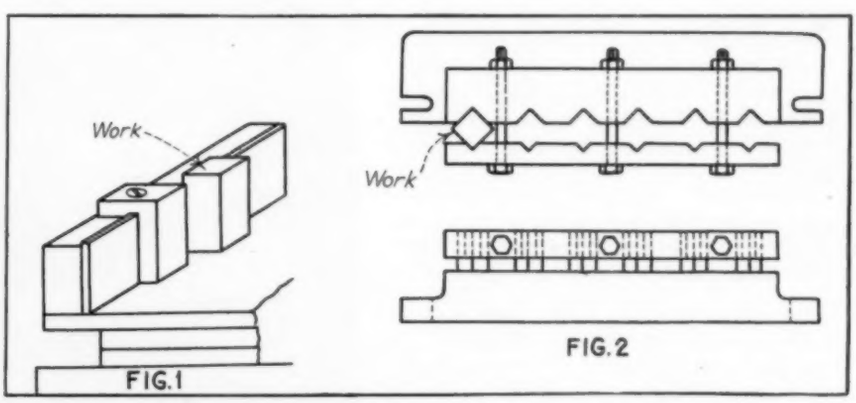
Squaring the Ends of Blocks

PETER L. BUDWITZ

In making blocks to be used for header dies, our procedure is to plane a long bar to the required size and to cut off the blocks from it, allowing enough for squaring the ends. The squaring device illustrated in Fig. 1, and fitted to the stationary jaw of a shaper vise, was formerly used for squaring one end of each block individually. The blocks were then ganged in a planer for squaring the opposite ends.

Due to the demand for blocks of various lengths, the fixture shown in Fig. 2 was made for the initial squaring of six blocks at a time. Because of the very short length of some of the blocks, it was decided to nest each one individually, rather than to gang them. Ganging had been tried, but proved to be troublesome, and the results obtained were not altogether satisfactory.

It will be seen that the fixture consists of the base, of which the stationary jaw having six vertical V-grooves is an integral part; the clamp having mating V-grooves of less depth than those in the jaw; and the three clamping bolts. As the V-grooves in the jaw form a series of V-blocks, accurate squaring of the ends with the sides of the blocks is assured. The squaring device in Fig. 1 is very convenient for toolroom use.



The fixture in Fig. 2 is a very satisfactory device for squaring the ends of six blocks at a time. The method of holding insures that the ends of the blocks will be square with the sides

SHOP EQUIPMENT NEWS

Wickes 26-in. x 13-ft. Semi-Automatic Crankshaft Lathe

A semi-automatic lathe which is being used for certain machining operations on crankshafts has been developed by the Wickes Brothers, Saginaw, Mich. This 26-in. by 13-ft. machine has a 12-speed headstock with power feed through a quick-change gear box. The machine is arranged for motor drive through a multiple V-belt. Automatic stops are provided for both front and back tools. The crankshaft is mounted on extensible centers and supported on center main bearing in a roller-type steadyrest. The crank is located longitudinally by a dial indicator against the outside face of the flange. Rear cutting tools are carried on an inverted cross-slide. Pressure on the front tools is downward, and the load is taken on the front cross-slide. Pressure on the rear tools is upward and the load is taken directly against the inverted cross-slide, which in turn is carried in the extremely heavy back-tool housing. This construction permits the taking of the heavy cuts without chatter.

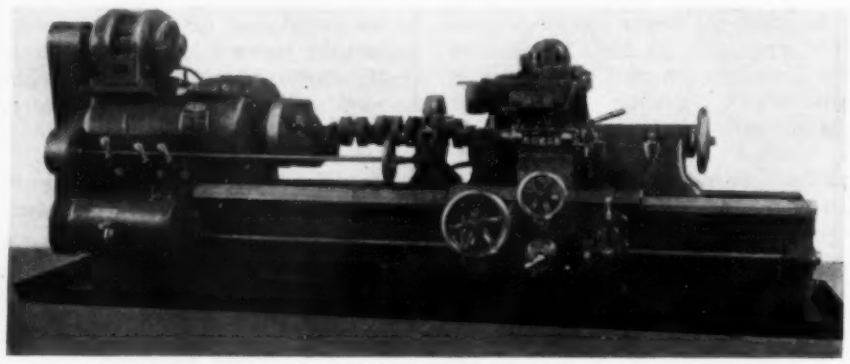
The lathe illustrated is set up for a 6-throw, 7-bearing, aeroplane-type crankshaft having an overall length of 53.3 in. The crankpins are 82 x 69 mm. (3.2 x 2.7 in.). Main bearing diameter is 96 mm. (3.8 in.). Scleroscope hardness is 50-56; Brinell hardness, 319-385. Production per hour is three crankshafts.

Magnolia Bearing-Bronze Bushings

Bearing-bronze bushings are now available from the Magnolia Metal Co., 120 Bayway, Elizabeth, N. J., semi-finished outside and inside, and in lengths of 12, 13 and 14 in. The bushings secured in this semi-finished state have no scale or sand to dull the tools, no blow holes or hard spots, no spongy metal, and no risk of having to discard a partly finished bearing because of hidden defects. S.A.E. Specifications No. 64 and General Motors Specification 4050M. Brinell hardness is 55 and tensile strength 25,000 lb. per sq.in.

Murex "Special A" Welding Electrode

High-carbon and high-strength steels can be welded with heavy coated electrodes announced by the Metal & Thermit Corp., 120 Broadway, New York, N. Y. A "Special A" electrode hinders the migration of carbon from the parent metal to the deposited metal when welding and assures a more ductile deposit. The deposit contains a small quantity of nickel. Tensile strength is 73,000 lb. per sq.in., yield point 59,000 lb. per sq.in., elongation 31 per cent in 2 in., and the reduction in area 63.5 per cent. Other recently developed Murex electrodes, designed for use with the latest high-strength steels, make possible welds with tensile strengths of 85,000 to 100,000 lb. per sq.in. Including nickel or molybdenum, or a combination of these elements in the deposited metal, it is possible for high strength to be secured. For example, one of the electrodes, depositing 2½ per cent nickel, has been used extensively for welds subjected to —75 F.



Wickes 26-in. x 13-ft. Semi-Automatic Crankshaft Lathe set-up for an airplane-type crankshaft with seven main bearings and six throws

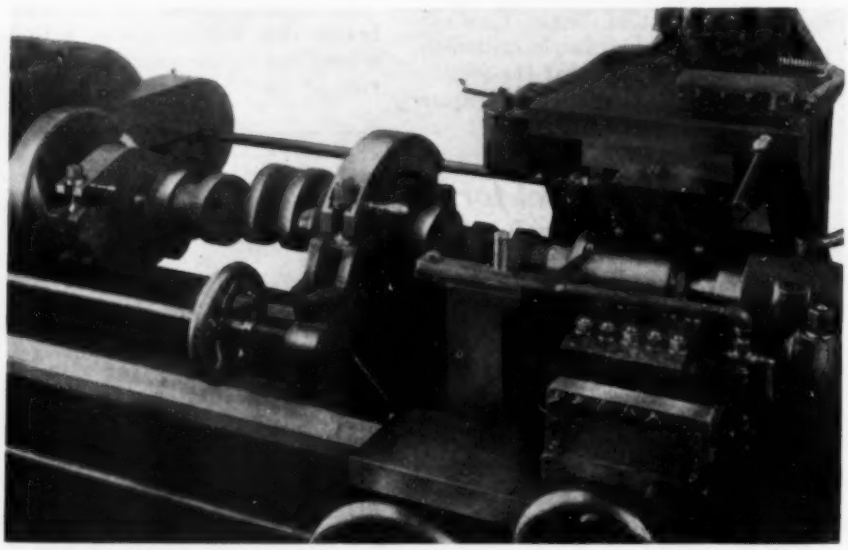


Fig. 2—Close-up of special tooling equipment. The operations consist of finish turn, finish face and chamfer flange, and finish turn long end of shaft. Production is three per hour

"Clearing" Die-Duplicating Apparatus

Duplicators that can be attached to ordinary vertical milling machines or horizontal boring machines for die-duplicating work are being made by the Clearing Machine Corp., 6499 West 65th St., Chicago, Ill. These duplicators, which are hydraulically operated, have the advantage that they leave the milling or boring machine intact for regular machine work. They do not interfere with the full working range of the machine in any direction, and no part of a duplicator need be removed when the cutter is to be used for regular work. Pressing an electric button starts the hydraulic pump on the die-duplicating apparatus. Masters may be made either from hard or soft materials, such as plaster of paris, wood or steel. The device is sensitive and is arranged to allow use of maximum feeds in all directions.

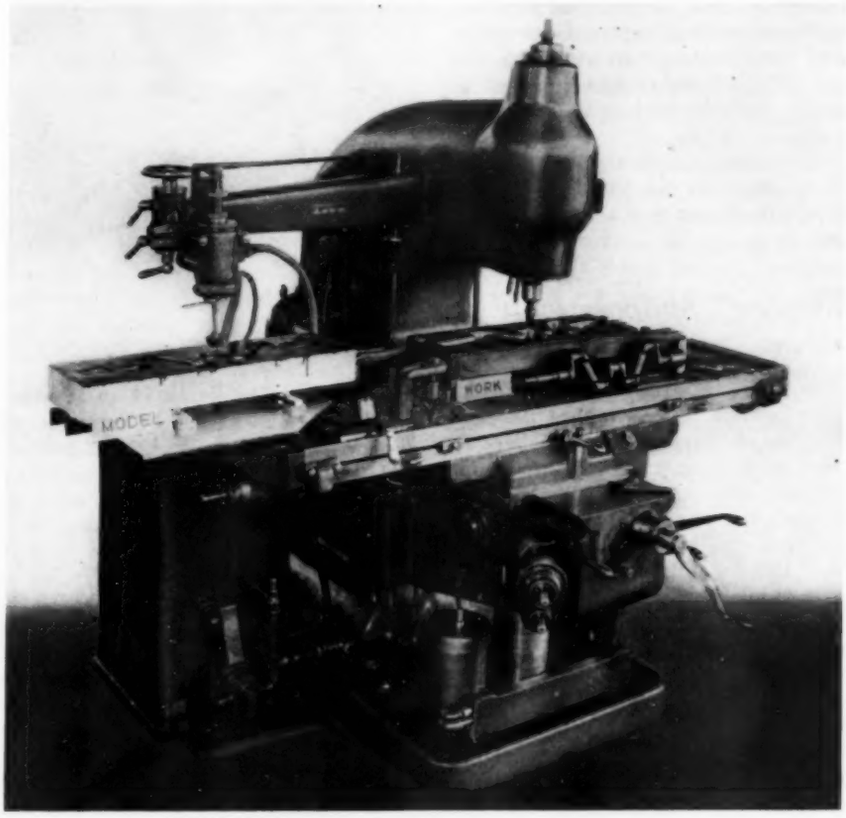


Fig. 1—"Clearing" Duplicator installed on a vertical milling machine for die-duplicating work

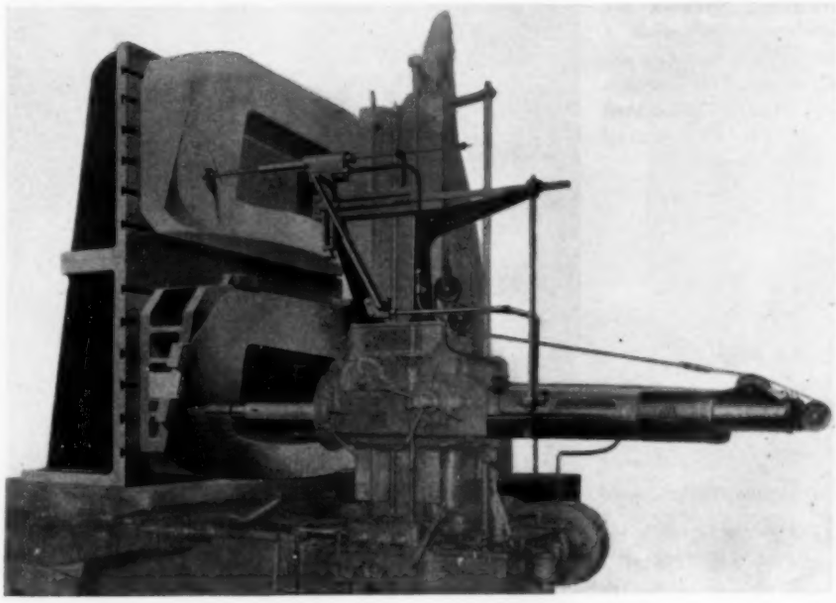


Fig. 2—Installation of the "Clearing" Duplicator on a horizontal boring machine

Each duplicator consists of an oil storage tank that is equipped with a motor-driven centrifugal pump. The vertical milling machine is equipped with two hydraulic cylinders located under the knee of the machine to move the knee and table up and down. An extension carries the master, and is permanently attached to the end of the table. A tracer arm is attached to the frame of the machine and overhangs the table extension.

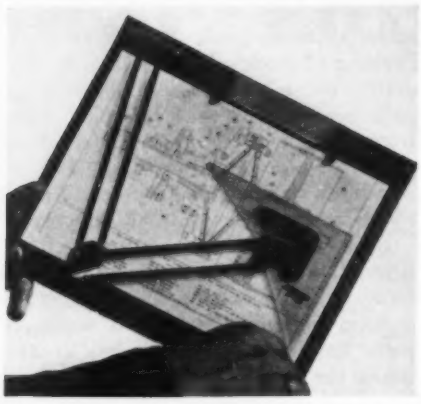
The device is set in motion by a push button that starts the oil pump motor. Oil flows through a manifold to the control valve, which is actuated by the tracer and is mounted at the free end of the tracer extension arm. Oil flows through the tracer valve to the cylinders under the table. The rise and fall of the table thereafter is under complete control of the tracer-actuated valve. A safety device stops the table if the cutter should happen to be mounted lower than the tracer, thereby avoiding damage to the cutter.

The horizontal boring mill is equipped with two cylinders that are attached to the spindle and brought in contact with the work and moved away from the work. The cylinders are controlled by a valve that is actuated by the adjustable tracer and mounted parallel with the cutter on top of the machine. Oil flows through the tracer valve to the cylinders at the end of the spindle to move the tracer and the cutter in and out. A safety device prevents the cutter from running into the work, if the cutter should happen to be adjusted closer to the work than the tracer.

Vertical die-sinking machines in which the table is stationary and the vertical spindle moves in and out may also be equipped with the duplicator by attaching the cylinder on top of the spindle, in order to move the spindle up and down, according to the flow of oil controlled by the tracer-actuated valve. On ordinary roughing work a rubber tracer tip is used, and either aluminum or steel tips are furnished for finishing cuts.

"Wrigraph" Drafting Blocks

The L. G. Wright Co., 9120 Fuller Ave., (P), Cleveland, Ohio, has developed the "Wrigraph" draft block, a drafting device made of $\frac{1}{8}$-in. Masonite



The "Wrigraph" drafting outfit will take a pad or letter-size paper

board and equipped with paper clips to hold either a single sheet or pad of letter-size paper. The parallel device has nickel-plated arms, connector and wrist plates, assembled with Tobin bronze bearings. Either of two drawing attachments is provided. The first attachment is a combination 30, 60 and 45 deg. triangle. The right angle sides of the device are graduated to $\frac{1}{8}$ or $\frac{1}{16}$ in. and provide drawing edges for horizontal and vertical lines without shifting position. The other drawing attachment consists of a protractor and graduated straight edge. Each machine is calibrated to a master parallel, ruled plate. The device carries a very low price.

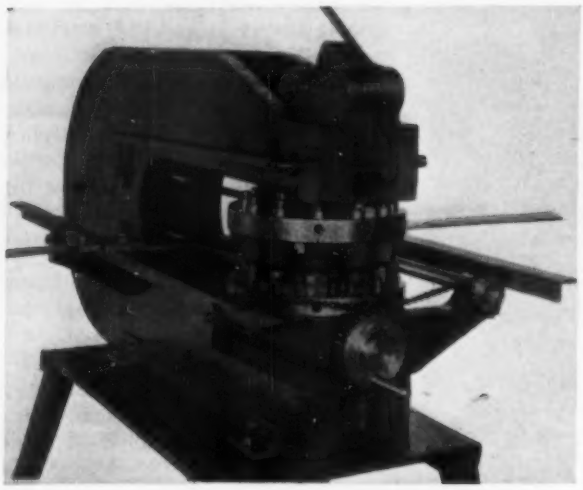
Wiedemann Type R-4 28-in. Throat Turret Punch

Wiedemann Machine Co., 1815 Sedgley Ave., Philadelphia, Pa., has developed a Type R-4 turret punch with a 28-in. throat. This hand-operated machine has a revolving turret for puching holes $\frac{1}{8}$ to 1 in. in diameter without changing punches and is complete with twelve punches and dies. It is capable of punching the following holes: $\frac{1}{8}$ to $\frac{3}{8}$ in. in mild steel $\frac{1}{4}$ in. thick; $\frac{1}{8}$ to $\frac{1}{2}$ in. in mild steel $\frac{3}{16}$ in. thick, and $\frac{1}{8}$ to 1 in. in mild steel $\frac{1}{8}$ in. thick.

The design is such that the punching of metal 48 in. wide can be undertaken. The two turrets, upper and lower, are mounted so that they can be revolved simultaneously and centered accurately under the operating ram by means of a hand lever. Punches and dies can be quickly removed and mounted in the turrets.

Specifications: Clearance between dies and strippers, $\frac{3}{16}$ in.; length overall, 46 in.; height, 25 in.; width, 12 in.; weight 1,500 lb.

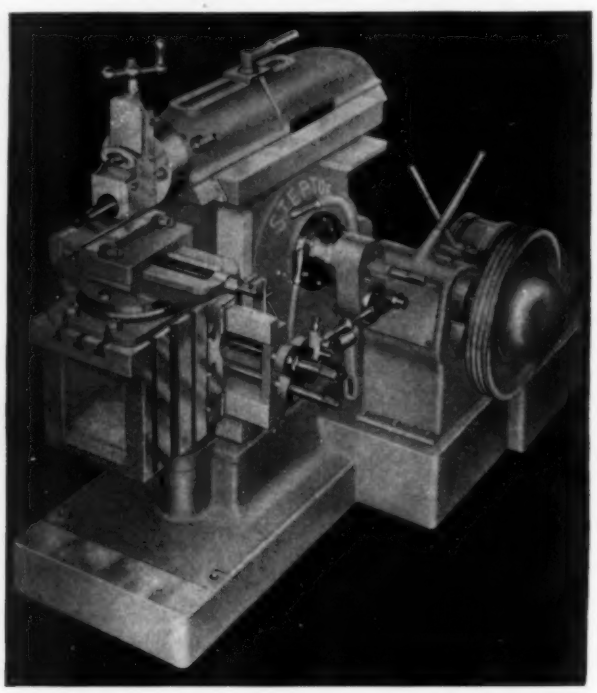
This larger model will take sheets 48 in. wide



"Steptoe" Shapers with V-Ram

The Western Machine Tool Works, Holland, Mich., has arranged its complete line of "Steptoe" shapers, ranging in size from 14-in., single gear, to 24 in., backgear, with a V-type ram. These machines also have an extra-large sized head that can be swiveled through an arc of 120 deg. Bronze and felt retainers keep all ways of the machine clean and oiled at all times. A fingertip-control feed mechanism and centralized control are provided. Timken roller bearings are employed. A speedbox is arranged with a Twin Disk clutch. The rocker arm block is of one-piece construction. The machine can also be equipped with a forced-feed continuous lubricating system including pump, filter and pressure gage.

"Steptoe" Shapers are now provided with a V-type ram that can operate at 130 strokes per minute. Illustrated is a 16-in. back-geared model

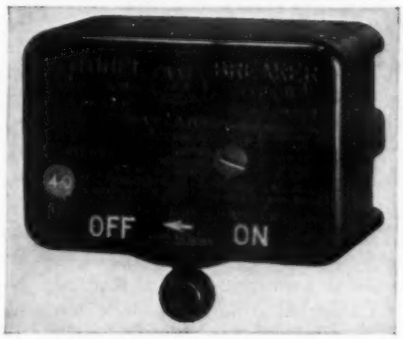


Skilsaw Electric Drills

Skilsaw, Inc., 3310 Elston Ave., Chicago, Ill., has developed a line of electric drills with universal motors, statically and dynamically balanced. The motor is cooled by a fan mounted on the armature shaft. The body is of die-cast aluminum alloy. Shaft is made of chrome-nickel alloy steel, heat-treated. A Jacobs chuck is used.

Westinghouse Type H Sentinel Breaker

For the protection of fractional-horsepower motors, the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has available single- and double-pole Type H sentinel breakers for protection against burnouts that might be caused by low voltage, locked rotor or overload conditions. The breaker is inclosed in a molded case. Metal parts are made of non-corrosive



Westinghouse Type H Sentinel Breaker for protection of fractional-hp. motors

metals. The breaker permits sufficient time delay to start small motors whose starting current is high in relation to the full-load current and also to permit such a motor to carry momentary overload without disconnection from line.

"Milwaukee" Face Mill Grinder

Ordinarily it requires from three to six times as long to sharpen a tungsten- or a tantalum-carbide milling cutter as it does to sharpen a high-speed steel or stellite cutter with the same number of blades. Efforts by the Kearney & Trecker Corp. of Milwaukee, Wis., to reduce the excessive amount of time required for sharpening carbide cutters have resulted in the development of a "Milwaukee" face-mill grinder that takes no longer for carbide cutters that was formerly required to sharpen high speed steel or stellite cutters. In addition, because of the strength and rigidity of this machine, the grinding time for high-speed steel and stellite cutters has been reduced.

The capacity of the Milwaukee face-mill grinder is for milling cutters up to 16 in. in diameter. All sliding surfaces are broad, fully covered, and protected against wear. The cutter spindle is mounted on Timken roller bearings, has the No. 50 national standard spindle nose, so that any cutter mounted on the Style "C" arbor can be sharpened without removing the arbor. Larger-diameter cutters are bolted on to the spindle nose so that adapters are unnecessary.

Graduated dials and all adjustment screws make setups simple. A jeweled-bearing dial indicator, reading to half-thousandths, is furnished. The indicator is permanently mounted on the wheel-spindle slide directly in front of the operator. With this indicator it is possible to check the accuracy of the finished cutter, as well as to check the cutter before grinding to see if it has been run too long and become wastefully dull.

The wheel spindle is large in diameter and is mounted on three anti-friction bearings. The flywheel keeps the abrasive wheel running smoothly and maintains uniform speed at all times. Because of the unusual hardness of tungsten carbide, the tendency is to slow down when the abrasive wheel comes into contact with the T-C tip. This causes excessive wheel wear and makes it a long operation to sharpen every blade uniformly. Therefore, with the flywheel the effects are three-fold: less wheel wear, uniform removal of stock from each blade, and reduction of time for sharpening the cutter. A spindle brake stops the spindle after turning off the motor. A complete blower system can be furnished for use where a central exhaust system is not available. Floor space required is 4x6 ft., and the weight is 2750 pounds.

Wright Improved Chain Hoist

Several improvements have been made in its chain hoist by the Wright Manufacturing Division, American Chain Co., Inc., York, Pa., for the purpose of increasing the durability and efficiency. A zinc coating is used on all exposed parts, making the hoist practicable for outdoor use and for service in

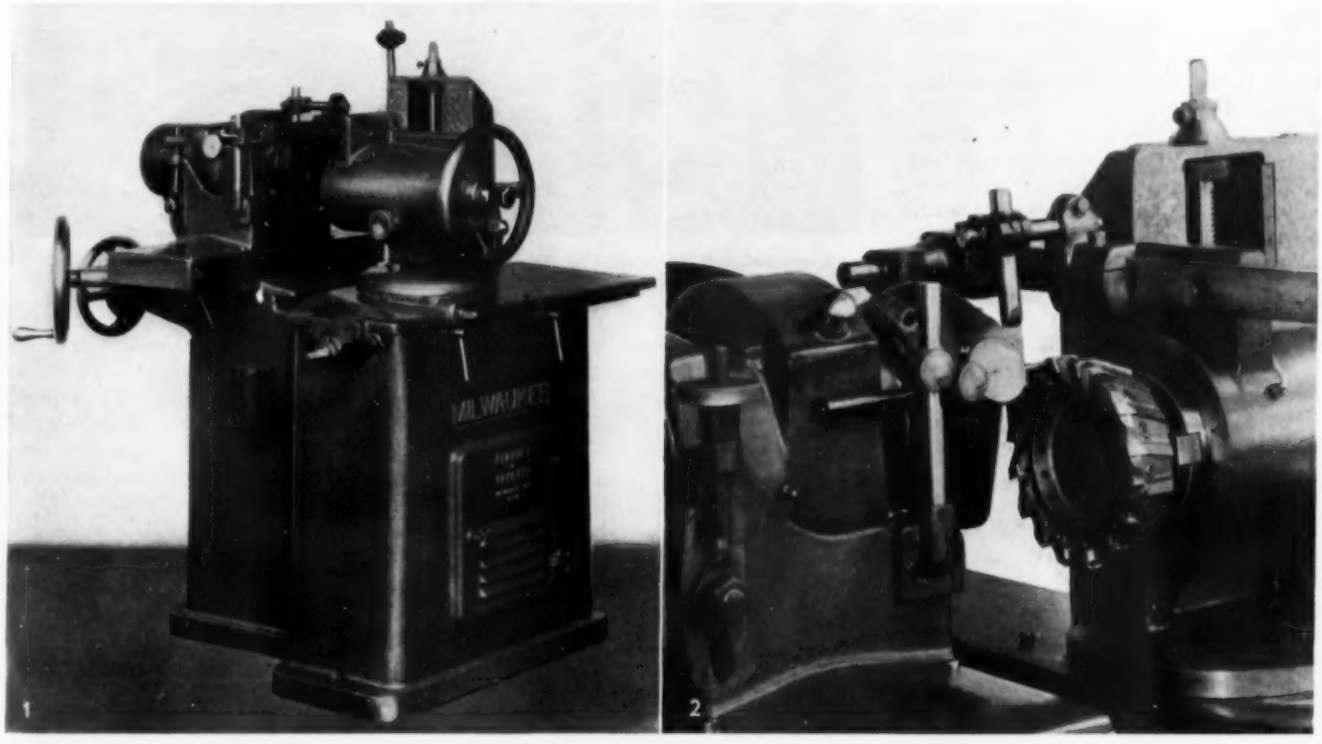


Fig. 1—Milwaukee Face Mill Grinder that will sharpen tungsten or tantalum-carbide milling cutters up to 16 in. in diameter in the same time as high speed steel or stellite cutters with the same number of blades. Fig. 2—Close-up showing the adjustments and also the dial indicator which is used to check the accuracy of the finished cutter as well as to check the cutter before grinding

Wright Chain Hoist with zinc coating and sealed ball bearings

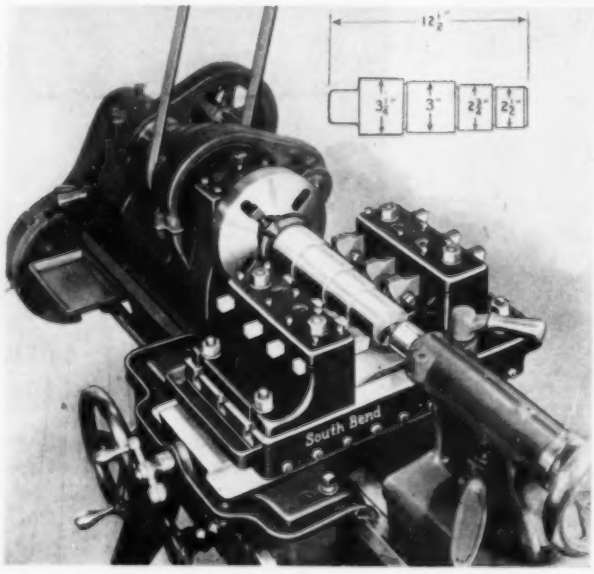
moist and corrosive atmospheres. The addition of precision ball bearings with integral grease seals supporting all moving parts increases the efficiency by 10 per cent. Wear is reduced. Other improvements include hardened pawl tip, improved load chain guard and ball spring covers on the oil tubes.

South Bend Multiple-Tool Base Saddle for Engine Lathes

A special production saddle for engine lathes has been developed by the South Bend Lathe Works, South Bend, Ind., for use with regular 13-, 16- and 18-in. swing, screw-cutting precision lathes. This saddle, called the multiple-tool base saddle, is designed primarily for mounting special tool-holding blocks for multiple-tool machining work. A slotted table is carried on the saddle, and multiple-tool-holding blocks may be mounted on the table at front and rear. The accompanying illustration shows a set-up for a turning and necking job. As will be seen, the front tool-holding block holds four turning tools for turning four diameters. The rear tool block holds three parting tools for shouldering and necking.

The saddle is connected with the automatic longitudinal feed and has automatic cross feed. Micrometer cross feed stops for front and back tools permit the turning out of accurate work in production. An automatic stop is provided for the automatic longitudinal feed.

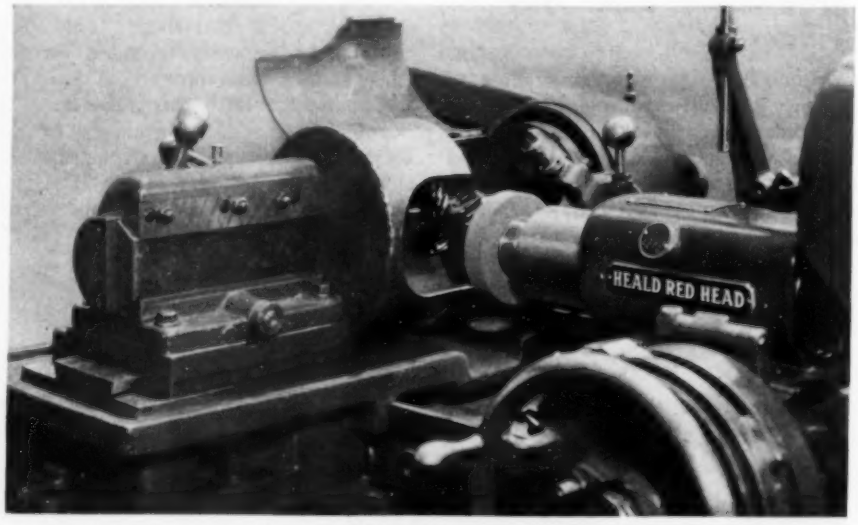
The multiple tool base saddle can be used for a variety of multiple-tool set-ups. Motor shafts, pump shafts and other parts having several diameters can be machined in one set-up. In addition to handling such work, the slotted table may be used as a clamping table for doing milling, boring, reaming, drilling, keyway cutting and other work.



A multiple-tool base saddle fitted to a 16-in. lathe. Motor shafts, pump shafts and other parts having several diameters can be machined in one set-up

Heald Special T-Base Grinder

The Heald Machine Co., Worcester, Mass., has built a special T-base grinder for finishing the ends of cluster gears. The requirements of the job call for close tolerance with regard to the length of the gear and that the end surface must have a concentric finish. The machine is arranged with a standard No. 72A internal-grinding-machine hydraulic driving mechanism for the table, and with a standard cross-slide for the wheel-head. On top of the T-end of the base is a bridge with a swivel adjustment permitting the work to be squared up with the wheel. This bridge carries a headstock and tailstock for centering and holding the gear. The headstock is motor driven, has a spring center and faceplate for positive endwise location of the gear and driver, and is arranged so that the operator can turn the gear



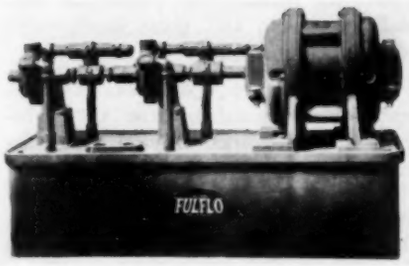
A special T-base, standard No. 72A table drive and "Red Head" wheel unit adapted by Heald for face-grinding cluster gears

end for end to permit grinding both ends.

A tailstock is provided with a dead center and is adjusted to take care of various lengths of gears. A positive stop controls the length of the table stroke and the wheel unit, which is of the "Red Head" design, and carries a 5-in. wheel. This wheel can be worn down to 2⅞ in. in diameter and the required speed change is taken care of by a two-speed motor that drives the head.

"Fulflo" Tandem Motor-Driven Oil Pump and Tank

A compact hydraulic power unit for use in machine tools and other equipment has been developed by the Fulflo Specialties Company, Inc., Blanchester,



"Fulflow" Tandem Motor-Driven Oil Pump and Tank, a compact power unit

Ohio. This unit consists of a motor, tank and two "Fulflo" spiral-gear pumps. Dual control makes possible two separately controlled hydraulic movements. Separate relief valves provide for by-passing so that the oil pressure required can be maintained in each pump. The unit is mounted on a cast-iron base, which in turn is mounted on a steel supply tank. A 1½-hp. motor, a.c. or d.c. is supplied for operation at 1,140 r.p.m. Maximum pressure on each pump is 200 lb. per sq.in., and delivery of each is approximately 3 gal. per min. The pumps are connected to the motor by flexible couplings.

Elwell-Parker Gas Lift Truck

A 3-ton, gas-operated, industrial lift truck has been added to its line by the Elwell-Parker Electric Company, Cleveland, Ohio. The controls are grouped within the easy reach of the operator's right hand. Two speeds forward and two reverse are furnished. The arrangement of the controls permits the keeping of the operator's left hand continually on the steering wheel at the left. The throttle control is located under the balancing grip by which the operator steadies himself when traveling at high speed, and thus puts the control of the truck literally under the operator's thumb. A single pedal controls both the brake and the clutch. Pressing down the pedal releases the brake and engages the clutch. Releasing the pedal automatically disengages the clutch and then applies the brakes. Brakes are set, therefore, the instant the operator steps off the platform or even lifts his foot. A hydraulic type of hoist mechanism receives fluid under pressure from a pump direct driven by the motor. The cylinder, through a balanced lift, elevates the platform which is mounted on rocking links. Extra clearance beneath the platform has been provided to avoid catching as the truck passes over toe-plates or rides over the top of a ramp.

Spedia Extra-Fine Lapping Wheels for Carbides

Thos. Prosser & Son, 15 Gold St., New York, N. Y., have announced that "Spedia Wheels" (diamond impregnated lapping wheels made of molded bakelite) are now available in an extra-fine grade for polishing Widia and other cemented carbides. Also available is a taper cup wheel 3 in. in diameter for use on cutter grinders, and made in the regular lapping grade. With these two additions to the company's line, additional Widia and other cemented-carbide tools can be resharpened by the user to secure longer life between grinds and better finish on the work.

Dixon "Graph-Air" Gun

The Joseph Dixon Crucible Co., Jersey City, N. J., has developed the "Graph-Air" gun illustrated for blowing "Microfyne" flake graphite into mechanisms for lubrication. This device is made of rubber and deposits the graphite where needed in measured amounts through positively controlled air pressure. The volume is largely controlled by the position of the nozzle in relation to the dial on top of the gun. When not in use the nozzle may be turned to a complete shut-off position. A plug fitted to the bottom of the gun carries a disk of chamois for use as a burnisher.

The Microfyne graphite provides temperature-proof, combustion-proof, dripless and odorless lubrication on metal, wood, rubber, leather, paper, fiber, composition, varnish, lacquered or painted surfaces. It also is used as a co-lubricant with plain oil or grease, being blown into oil holes or upon oiled or greased surfaces, or mixed with plain oil or grease before applying. In the latter case, the graphite functions as an additional lubricating agent.

The company has literature showing a large number of applications of the Graph-Air gun and Microfyne lubricant.

Trent Immersion Heater

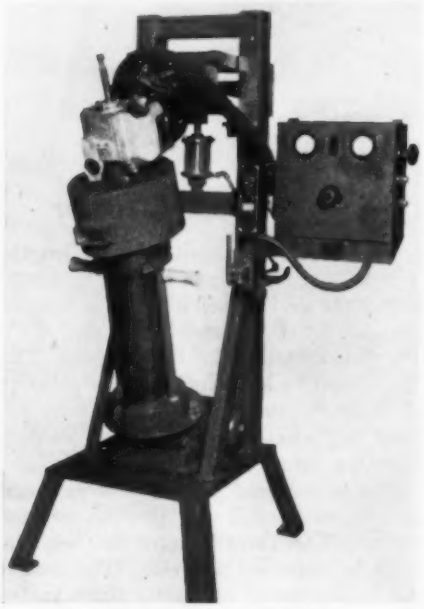
Immersion heaters with a body length of 6 to 16 in., ratings of 500 to 2,500 watts, 115 or 230 volts, are now manufactured by the Harold E. Trent Co., 640 North 54th St., Philadelphia, Pa. These heaters are supplied with a body of seamless brass or copper fabricated from one length of tubing and welded into the head. The outlet box attached to the head is removable and can be rotated to suit the position of the wiring. The thread under the head is a 1¼ in. standard pipe size. The heater can be connected for one or three heats. Bodies can be supplied lead plated or in steel or chrome alloy to resist corrosion.

Lincoln Automatic Welder for Automobile Mufflers

Automatic machines for welding automatic muffler assemblies by the shielded carbon arc process are announced by the Lincoln Electric Co., Cleveland, Ohio. These machines, equipped with "Electronic Tornado" welding heads, have a production capacity of 115 pieces per hour. The equipment used consists of two machines, one a vertical type as shown and the other a horizontal model. With the welder illustrated the operator places the muffler in position, lowers the welding head, edge welds the tubes in place, raises the head and turns the muffler upside down where he welds the pipes on the other end. The complete operation requires 30.5 sec. A second machine lap welds the muffler tubes for connection to the exhaust pipe.

Noble & Westbrook No. 19-H Strip Marking Machine

The Noble & Westbrook Manufacturing Company, 20 Westbrook St., East Hartford, Conn., has designed a No. 19-H machine for marking strip or ribbon stock from ¼ to 1½ or 2 in. wide, and from 0.025 to ⅛ in. thick, with a continuous inscription. This machine will mark a name or address, trademark or design, either continuously or at every few inches. A worm and gear drive is powered by a motor. The top roll of the machine carries the marking die and the bottom roll the pressure roll. Both rolls are geared together and act to apply pressure for making the mark and also as a friction drive to carry the stock forward automatically. Provision is made in the marking roll so that the marking die can be changed easily. The distance between the rolls, when different thicknesses of stock are to be marked, is secured by an eccentric shaft attached to the upper roll. Guides for centering the strip stock are adjustable as to the width. Two speeds of operation are provided, 125 and 200 ft. per min. The weight of the machine is 350 lb.



Lincoln Welder for mufflers

Noble & Westbrook No. 19-H Marking Machine

• TRADE • PUBLICATIONS

AIR COMPRESSORS. Pennsylvania Pump and Compressor Co., Easton, Pa., is distributing Bulletin No. 104 on air compressors, showing the various construction features.

ELECTRIC TOOLS. The Stanley Electric Tool Co., New Britain, Conn., is distributing Catalog No. 64 showing the various types of electric tools that it manufactures such as drills and drill stands, grinders, hammers, sanders, saws, screw drivers and "Unishears" (cutting shears), together with attachments, chucks, and grinding wheels.

GEARS AND SPEED REDUCERS. A Catalog 57 on stock gears, sprockets and speed reducers has been issued by the Charles Bond Co., 617 Arch St., Philadelphia, Pa. Miscellaneous items such as pillow blocks, hangers, bearings and casters are listed. The catalog is unusually complete and gives much engineering information.

GEAR FINISHING MACHINES. Two recent folders issued by the City Machine & Tool Works, Dayton, Ohio, describe separately the "Peerless" gear chamfering machine, and the "Cimatool" (Bolender) gear burnishing machine. Each of these folders describes the particular machine completely, shows recent improvements and gives specifications of the several sizes available.

MACHINE TOOL TECHNOLOGY. A unit course of instructions for students and apprentices in the machinist and toolmaker trades. Published by the National Metal Trades Association, Peoples Gas Bldg., Chicago, Ill. Complete sets are priced at $8 and individual sections as follows: hand tool, 80 cents; engine lathe, $3.00; milling machine, $1.40; cylindrical grinding machine, $1.40; shaper, $1.60, and turret lathe, $1.80. This course was developed by the Association's Committee on Industrial Education and was assisted by more than 100 practical shop men and a group of trade school instructors. It is suitable for use in company training programs or in public schools offering practical or related instructions in these trades.

MOTORS AND GENERATORS. Horizontal and vertical motors in a wide variety of electrical types and geared-head motors are illustrated and briefly described in an eight-page folder issued by The Master Electric Co., Dayton, Ohio.

ROLLER BEARINGS. A catalog on tapered roller bearings has been published by the Bantam Ball Bearing Co., South Bend, Ind. This catalog includes a thorough treatment of load-carrying capacities and other pertinent information. Over 1500 bearings are listed in detail and other types are shown which can be furnished in standard or special sizes. Tables giving safety factors for 33 different types of service, and a speed capacity chart for all types is included.

STEEL. A folder on "Cromansil" steel now made in sheet and plate form by the Lukens Steel Co., Coatesville, Pa., gives a table comparing Cromansil and other structural steels, and much information on fabrication and shop use, stressing welding by oxy-acetylene and arc methods.

V-BELT DRIVES. A 42-page loose-leaf data book and price list has been published by The Medart Co., Potomac & DeKalb Sts., St. Louis, Mo., giving complete engineering and purchasing information on all types of multiple- and fractional-horsepower V-belt drives made by the company.